POPULAR SCIENCE

INCLUDING MECHANICS AND HANDICRAFT

35c March

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100-Knot Liner to Fly on Sea Wings

PAGE 105

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In Canada: Mfd. by Evinrude Motors, Peterborough

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2. Pick up rules and entry blank.
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PS Readers

TALK BACK

Cops Are Smart Car Traders

You might like to know that we have received several comments on your article "When Is the Smart Time to Trade in a Car?" [Aug.] which was reprinted in our publication *The Notebook*.

Although the issue has been out only a few days, it has already caused some reconsideration by car purchasers. Seeing that members get maximum benefit from their dollars is basic credit-union policy and the article seems to be accomplishing this. We appreciate your permission to reprint it.

E. R. Blackstone, Clerk
Police Credit Union, San Francisco.

Extras Are Extra on U. S. Cars

When comparing the Lark with the imports [Dec.] you should have defined "without options." A heater, whitewalls, electric windshield wipers and so on are standard on several of the foreign makes you listed, but extra cost on the Lark.

Edwin W. Huser, Teaneck, N.J.

What to Do When Your Lights Conk Out

The little booklets in your magazine are fine and I save mine. Some time back [July, '57] you had one called "What to Do When Your Car Conks Out." Alas, you left out one important problem: what to do if your lights go out. When mine did, I had to drive in the dark!

W. E. Trull, Auburn, N.Y.

Easy fixes are few. Look for a loose or broken wire and, if necessary, replace the fuse (you should carry spares). Don't cheat around the fuse: If the short that blew the fuse still exists, restoring current could easily start a fire.

Expert Applauds Brake-Fade Article

I read with great interest your article "The Baffling Problem of Brake Fade" [Jan.]. You did an excellent job of placing the brake engineers' problems before the reader. I was especially impressed with your comments under the headings "Heat is the Main Problem" and "How Big is a Brake?"

B. B. Brombaugh, Section Engineer
Inland Manufacturing Div., Dayton, Ohio.

Semantics in Space

Please don't take this question too seriously. In "The Month in Science" [Dec.] you say that as a space vehicle falls back to earth, "it is at top speed when it hits the dense air, and *friction burns it up*." When you think of striking a match: Friction doesn't burn it up, it ignites the match. Correct?

Frank Victor, Ph.D., NYC.

Little Cars Rated Low as Snowplows

I trust those readers who have been expressing undying love for undersized foreign cars had fun driving through snow and ice this winter. I was quite content with my gas-gulping monster while figuring out how much money I had saved in towing costs.

It was fun plowing through and trying to find the economical foreign babies

that had become buried. The greatest joy of all was sitting in my luxury-loaded Chevy warmly watching shivering owners whose midgets were being towed away.

Donn King, Rome, N.Y.

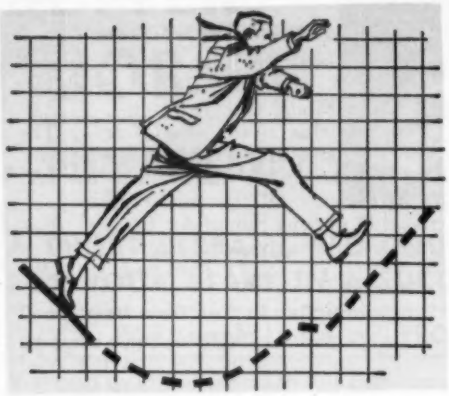
They Won't Sprout from Seed

I am sure some bright lab men could figure out how to make wallboard or other building material from surplus wheat ["PS Readers Talk Back," Jan.].

But I read somewhere recently that In-

HOW TO JUMP THE SLUMP!

Here's a way to cash in on present job trends and avoid the current dip!



While some men are out of work or just hanging on, many others are actually advancing into more responsible, high-pay jobs.

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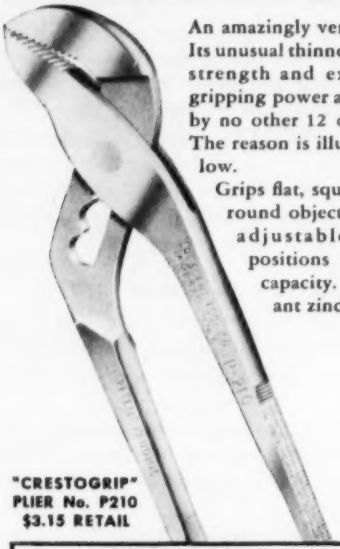

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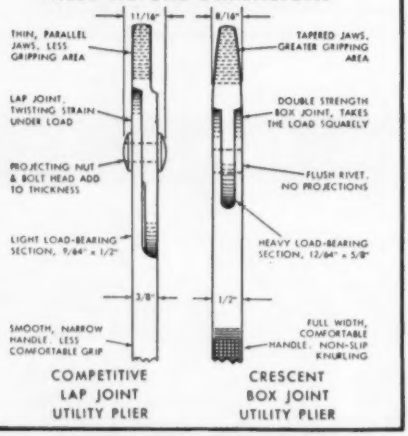

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JASON KAUFMAN, Chicago.

Dog's Best Friend Heard From

I'M haunted by that woeful, unloved look on the dog under a blanket ["Hints from the Model Garage," Jan.].

Maybe this is the inside story: The pooch is ashamed and embarrassed for his master who didn't train him in the first place to stay off the car upholstery instead of putting him under that hot, dark old blanket. It shouldn't happen to a dog.

L. D. JOHNSON, Erie, Pa.

Buy a New Car As You Do a Used One?

YOU say "everybody can get what he wants" this year in cars ["What You Think of the '59s," Jan.]. I hope so.

In '57, I had a '57 Rambler with Flashaway transmission. This worked only when the car was hot. The engine started and ran perfectly, but when you put the selector lever in drive, the car jumped

like a bucking bronco. And how it hated to go in reverse!

A car is the only thing on sale today that carries no guarantee. I'd advise your readers to take your booklet No. 9, "Checklist for Judging Used Cars," with them when they buy a *new* car. And check out the automatic transmission in reverse. Another thing: Make the trial run early in the morning—this brings out the worst in the automatic choke.

F. G. DOHERTY, Norwood, Mass.

Rambler, Lark Eights Are Over-Square

IN THE Devon Francis report ["How Studebaker's New Lark Stacks Up Against Rambler," Dec.], he says that the V-8s in both these cars—like the in-line engines—are under-square. I believe that

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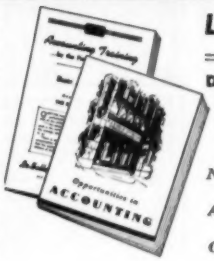

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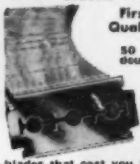

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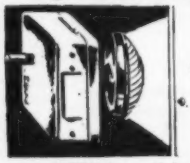

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Amazing new Lite-On lights all closets automatically. No wiring! No costly electrical installation! Attach Lite-On in 2 minutes. Fits all doors. Works on same principle as light in your refrigerator. OPEN door—light goes on. CLOSE door light goes off. No more groping & fumbling in dark for special tie, shirt, suit, belt, dress. Swivel head-beam on Lite-On directs powerful light to darkest closet corner! And you can't forget to leave closet light on—ever. Once you shut door light goes off AUTOMATICALLY. Comes complete with screws, illustrated 1-2-3 directions, etc., for easy 2-minute installation. Works on standard batteries (not incl.). No. 958.

12 WOOD CARVING KNIVES ONLY 1.69

12 sharp surgical steel wood-carving knives, Reg. $2.00, now only $1.69. Each knife almost 6 inches long; 4 1/2" hardwood handle. 12 different shapes & edges do hundreds of jobs. Sculpturing, whittling, leather tooling, crafting knickknacks—even cutting of gems & stones.

No. 2140 . . . . . $1.69

Car Coat Hanger

HOLDS 10 GARMENTS plus Hat!

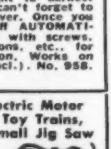
99c

Now — convert your car hook into a 10-garment hanger with this steel attachment. Just hook on to your car hook. It holds 10 garments PLUS a hat—yet you have no loss of vision. And it carries the clothes neatly, without wrinkling. Folds flat, stores in your glove compartment. Fits any car, any model. Has protective pad that prevents it from marring your car. Constructed of heavy gauge plated steel—holds 10 winter garments WITHOUT sag. No. 910, 99c

This Electric Motor Drives Toy Trains, Boats, Small Jig Saw

Orig. 2.98

99c



Powerful, rugged, built by craftsmen. Fits palm of hand yet gives giant performance—up to 3,600 RPM's. Permanent magnetic field, bronze bushings, steel housing and mounting base. Drives model planes, trains, boats, erector sets, small jig saws, displays, wheels, etc. Works on any flashlight battery. Thousands sold at $2.98. Yours at less than HALF PRICE.

No. 103 Motor . . . . 99c.

FROM THORESEN'S!

Dept. 7-C, 585 Water Street, New York 2, N.Y.

Midget TV Indoor Antenna

Replaces Rabbit-Ear Models that Cost up to $9.95.

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No bigger than a pocket watch, yet this midget indoor TV antenna pulls in sharp, clear pictures equal to a $9.95 model we tested. Installs in 60 seconds. No technical knowledge or special tools needed. Hide it behind drapes, picture, lamp—even under the rug! Eliminates old-fashioned, unsightly "rabbit-ear" antennas. Weatherproof. Unbelievable. Never wears out. Works on any set. Guaranteed to give you better reception or YOUR MONEY BACK. Thousands sold. Usually 2.48 No. 3000 ..... $1.98.

Korium 10-in-1

50,000 Sold at $3.98!

1.98

9 inches long when opened

10 tools in one. Saw, file, corkscrew, awl, utility knife, bottle opener, screwdriver, small knife, can opener, scissors. Each separates easy to open, use and close. No jamming or slipping. Genuine Korium steel. Replaces multitude of tools you can't find when needed. Take on fishing, hunting, outdoor-trips. No. 18. $1.98.

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★ Stainless Steel Parts! ★ Unlimited Guarantee for Lifetime of Thoresen's! ★ Same Type as Advertised on TV for $19.95 ★ New Hi-Power Heavy Duty Model

Not 19.95

7.99

New model. New powerful built-in electromagnetic vibrator motor pumps. All metal parts stainless steel or brass. 60-80 lb. nozzle pressure adjustable from fog-spray to heavy stream. EXCLUSIVE magic nozzle sprays straight, up, down, sideways—without tilting jar. Only Hi-power has this feature. Other sprayers require 2 nozzles to do this, which means constant changing of nozzles as you work. This is the model you've seen advertised in Popular Science, Mechanix Illustrated, Popular Mechanics, N. Y. Times, True, Argosy, etc. 52,000 already sold! Takes paints, enamels, lacquers, disinfectants, deodorants, etc. Cuts painting time up to 70%. Just plug in, press trigger and spray. 101 uses—mothproof clothes, touch-up fender scratches, refinish furniture to look like new, etc. Unlimited Guarantee of Service. Should sprayer need adjustment or repair—EVEN after 5 years—experts do them FREE of charge. (Parts, only if necessary at cost). Same type sprayer as formerly advertised on TV for $19.95 No. 95 ..... $7.99. DE LUXE MODEL with JEWELED tip for fine, precision work. COPPER FILTER heavy-duty electric cord. Same features as in a $24.95 model. Only $9.99. Order by No. 95-D.

Now—Seal Social Security Cards, Driver's License, Certificates, Clippings, etc. In Clear Plastic—in just 60 SECONDS!

12 Plastic Sheets, 4" x 4"

6 Plastic Sheets, 5" x 7"

99¢

Take a good look at your social security card, your driver's license, identification card, favorite wallet-size photos, etc. Are they soiled dog-eared, torn? Now, in just one minute flat, you can seal these valuable cards and papers in clear plastic—and at a fraction of the usual cost! With this do-it-yourself "Seal-in-Plastic" Kit you can seal wallet-size cards or photos—even birth certificates, discharge papers, etc., fast and easy. Seal may be permanent or removable. FREE identification card included with order. Each kit seals 6 wallet-size cards or photos.

No. 248 Complete Kit 99c

Drive Thru FOG SAFELY!

Yes, drive thru thick, soupy fog safely with No-Fogs. Convert your headlights into powerful FOGLIGHTS in seconds. Fit all headlights thru 1959 cars. Press them on, they stick like skin; to remove, merely pull off. Flexible as rubber yet transparent as glass. Can't break, chip or peel. You SEE while others GUESS! No. 138 **95c pr.**

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10" Grip Wrench with automatic tension release. The steel jaws develop up to 1 000 lbs. pressure—and stay locked until released by you! Actually doubles your hand power. Non-slip grip holds objects of any shape. You can use it as a quick clamp, a pipe wrench hand vise, toggle press. Adjusts instantly by twist of knurled knob. UNBREAKABLE solid steel jaws. $3.98 value. No. 912 .. **1.98**

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Terrific value from West GERMANY—home of the finest machine tools! 13 precision Chrome Vanadium Drills from 1/16th thru 1/4 inch by 64ths, enclosed in a handy Metal Indexed Jacket for quick, fingertip selection. Drill thru woods, plastics, aluminum, iron, even thick-gauge STEEL. You'll get years of excellent service from these hi-speed drills. $5.95 value—our price only $1.98. Order by No. 13. 13-piece set. $1.98

New Eyelet Tool Punches Hole—Sets Eyelet at Same Time!

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300 Eyelets 50c value. Yours FREE!

No. 9 Eyelet Tool...$1.98

One of the handiest tools we've seen in years for home, school, office. Amazing new 2-in-1 Eyelet Tool—punches hole and sets eyelet AUTOMATICALLY in one easy operation! Use on paper, cardboard fabrics—even TOUGHEST LEATHERS! Made of rugged Korium STEEL by craftsmen. Make holes in belts, binders, lacings, sneakers, bags, picture frames, etc. Why use makeshift tools like ice picks, scissors, knives—and risk cutting your fingers? This Eyelet Tool is fast and simple—like using a punch. Can also be used to make holes alone without eyelet if desired. Once you see this tool you'll wish you had it years ago.

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"I had a successful Radio repair shop. Now I'm Engineer for WHPE." *V. W. Workman*, High Point, N. C.

"Doing spare time repairs on Radio and TV. Going into full time servicing soon." *Clyde Higgins*, Waltham, Mass.

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both the Lark and the Rambler V-8 engines have a larger bore than stroke and are therefore over-square.

E. M. SMITH, Nutley, N.J.

Right. Bore and stroke are 3.5 x 3.25 inches on the Rambler V-8, 3.56 x 3.25 inches on the Lark V-8.

Case of the Falling Hammer

THE December Know-How File ("Using a Nail Hammer") advises the nail pounder to strike with the center of the face, that is, hammer face and nailhead flush, surface to surface.

But the hammer descends in an arc, so the inside edge of the hammer face strikes

the nail, often bending it. Now if the face of the hammer were slanted inward slightly toward the handle, it would hit the nail square on the head.

M. BERGER, Philadelphia.

It is and it does. If you study your own hammer, you'll probably find that the face slants slightly toward the handle.

Chain Is Better

ORDINARY sash chain (No. 8) from the hardware store is more efficient and reliable for fishing electric cable through walls than the string suggested in "Short Cuts and Tips" [Jan.]. Chain always drops straight down, will not break if you jerk it, and is easy to hook.

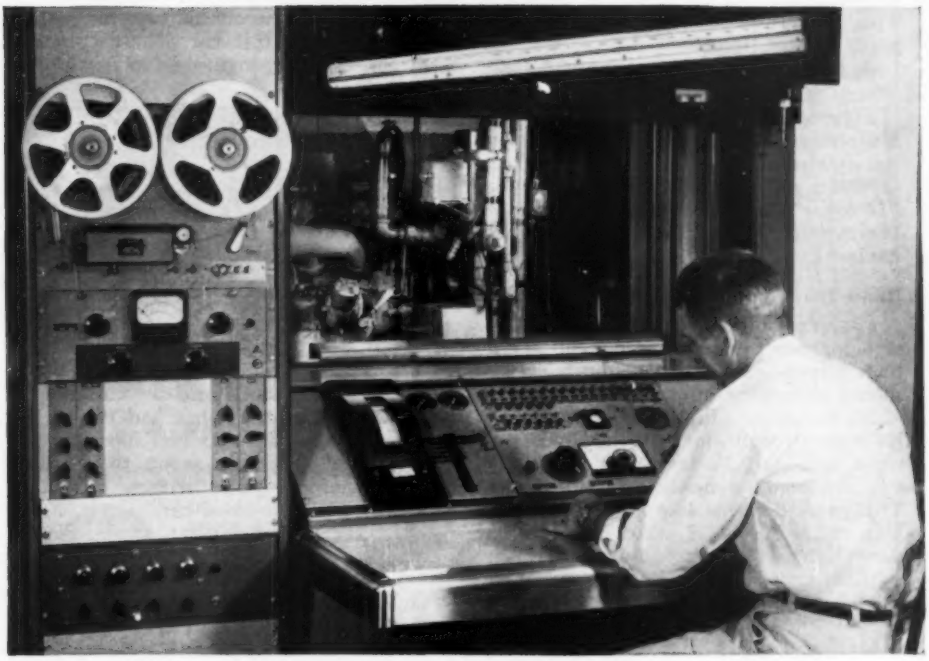
F. H. WAGENER, Red Oak, Iowa.

For more tips on snaking wires, turn to page 155.

Is He Right?

YOU'RE wrong by 100 years ["World's Largest Propeller," Nov.]. A prop of the same size—24 feet in diameter—was used in the Great Eastern, launched in 1858.

This was the ship that laid the Atlantic cable. She was 692 feet long, had a beam of 120 feet and a 22,500-ton displacement. Two engines gave out a total of 11,000 hp. One powered the big screw, the other



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Other Perfect Circle firsts include famous PC 2-in-1 Chrome piston ring sets. Top rings and oil rings are plated with thick, solid chrome. Entire area of ring travel gets complete wear protection, *more than doubling* life of cylinders, rings, and pistons. No tedious break-in is necessary—rings are pre-seated at factory.

New Perfect Circle Valve Seals stop oil loss through valve guides of overhead valve engines. For best performance, valve or ring jobs should include installation of Perfect Circle Valve Seals. The cost is surprisingly low.

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PERFECT CIRCLE

Hagerstown, Indiana **Don Mills, Ontario, Canada**

turned paddle wheels 58 feet in diameter. This famous vessel carried 6,500 square yards of sail, too.

A. H. MATTHEWS, Lake Beauport, P. Q.

Figures given by the Encyclopaedia Britannica *differ, although screw size is not mentioned. The* Britannica *disagrees on beam (82.5 feet), displacement (18,914 tons) and horsepower (3,411 hp. for the paddle engines, 4,886 for the screw engines).*

Good Tip from a Smart Girl

I READ my father's POPULAR SCIENCE—it helps me with my science in junior high school—and I watch him when he makes something from your magazine.

My father says that if you stop sawing halfway through and wax the saw good, when you start sawing again you think you are using a newly sharpened saw. This seemed to me like a good idea for your magazine and I asked him why he doesn't share it. He says I may if I wish.

JEANNETTE ROBERTS, Portsmouth, N.H.

They Don't Make Them Anymore

MAYBE some of your young-squirt readers would like to see a real automobile—my Ford coupe, purchased new in 1930.

I have driven this car 553,925 miles with the original engine, have used 13

sets of tires, two radiators, two clutches, two universal joints. It has had two engine overhauls—the rear end has never been opened. This car is on the road every day of the year; in fact, I can't drive any other make of car.

W. J. NICOLL, Ocala, Fla.

"Best Report Ever Seen"?

YOU gave us a good practical and technical report in "All About Buying Electric Drills" [Dec.]. This is the best report

Hair problem got you in the doghouse?

Get Wildroot Cream-Oil Charlie!

Just a little bit of Wildroot and... WOW!

A GOOD JOB IS EASY TO FIND!

A mechanic in the Air Conditioning and Refrigeration field takes home big pay. He works steady—all year 'round—with lots of overtime, if he wants it. Be a mechanic!

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CTI training is practical, much like field calls. Most students do part-time work soon after enrolling. Some get jobs with dealers, others make calls on their own. A number sign service contracts with food stores, meat markets, motels, restaurants. With earnings, students pay tuition, buy shop equipment.

Be Independent! Open a Shop and Be the Boss

Many students make service calls, build up customer lists. Others get evening and weekend jobs. Upon graduation, a surprising number prefer to go in business for themselves. CTI training and CTI tools can give you a start. Service shops often blossom into sales rooms.

Auto Air Conditioning Is New Opportunity Field

Hundreds of thousands of new cars are being equipped with air conditioners. Auto dealers are advertising for skilled refrigeration mechanics, offering premium pay, to set up service departments. Or, you can go in business for yourself, and contract with auto agencies to do this type of installation and repair. You can make big profits either way. *Mail coupon for free facts.*

MAIL TODAY FREE BOOKLETS

You Learn by Practicing—Get Valuable Experience!

Another CTI "first"! You learn by practicing because CTI sends you 25 training kits. You get real experience, because you complete 23 "on-the-job" projects. You do 10 service and trouble-shooting "jobs"! You get all parts and tools to build a heavy-duty, commercial-type, ¼ h.p. condensing unit (above). Note photos of two of the 25 kits (left). One shows special service tools; the other includes motor, fan, pulley, more tools. *Kit training helps you perfect skill, get field-type experience, learn faster.* It's fun to learn this way.

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Address.....

City.....*Zone*.....*State*.....

of this type I've ever seen. I hope you will get around to giving us the same data soon on saber saws.

J. SMITH, Marion, Iowa.

See "The Year's Most Exciting Power Tool," published a year ago this month.

Right Tool for the Job

THE writer of "Soldering Guns Do Dozens of Extra Jobs" [Dec.] should try to soften putty with one of these guns. He has a revelation coming to him.

When he has stabbed away and given it up as a bad job, tell him to try an electric putty softener.

I bought a soldering gun specifically for removing putty and was disappointed. But I wouldn't part with it—for soldering small things, it can't be beat. But I also bought an electric putty softener, and for removing putty, it can't be beat.

J. R. HARMAN, Grand Rapids.

The Backward Model T

CERTAINLY reversing an old Model T on a hill would feed more gas through the gravity feed system ["PS Readers Talk Back," Dec.]. But there is another reason why old-timers frequently backed up a steep grade. The Model T had a lower gear reduction in reverse.

The reduction with standard gears was 9.98:1 in low; 14.52:1 in reverse. Actually, the gain in reverse was not quite so great because of loss due to friction, but there was still a definite gain.

LEO H. SIMONS, Herrick, S.D.

. . . I wonder if Gus Wilson's memory is as good as mine? I remember seeing many a Model T with a tire valve fitted to the tank cap. When the front end got above the gas level in the tank, the doughty driver whipped out the tire pump. Two or three strokes with this and he was on his way. Of course the tank had to be vented so the gas would feed once the lizzie was rolling again.

C. J. MCQUEEN, Milwaukie, Ore.

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The month in science

Earthquakes in Idaho? Yep. And bad ones. California bears the shaky reputation (because 90 percent of the nation's small quakes occur there) but serious tremors are just as likely over much of the rest of the country.

Caltech expert Charles F. Richter, plotting earthquake risks across the U. S., found that only the Gulf Coast, the Northern Pacific area, the North Central states and a section straddling Virginia and North Carolina are generally safe.

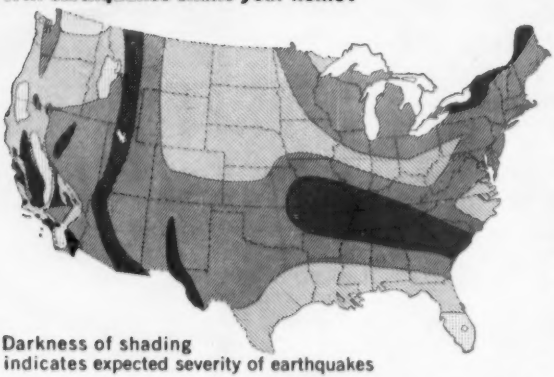
Dr. Richter rated areas by the intensity of the worst shaking to be expected over a long period of years. This "Modified Mercalli" scale goes like this:

- Intensity VI—slight damage to weak buildings.
- Intensity VII—considerable damage to weak buildings.
- Intensity VIII—slight damage to sturdy buildings.
- Intensity IX—considerable damage to sturdy buildings.

(Intensities less than VI cause no damage; over IX are rare.)

Trouble is, earthquake risk changes sharply from point to point within an area. It depends on the ground structure. Earthquakes start from a fault, a big break in the earth's rock formation. When one side of the fault shifts in relation to the other, the ground shakes, sometimes many miles away. Loose sandy ground shakes much harder than solid granite. That's what makes the difference.

Will earthquakes shake your home?



Darkness of shading indicates expected severity of earthquakes

Take New York City, for instance. It is in the range of two separate faults. Some sand-dune areas on Long Island are rated IX: Even sturdy buildings there would probably suffer considerable damage. But Manhattan Island—granite—rates only VII and possibly even VI.

Dr. Richter listed some of the nation's major cities as quakey: Boston, Buffalo, Washington, Chicago, Kansas City, Tulsa, Seattle, Portland and San Diego can expect moderate Intensity VIII shaking, enough to damage sturdy buildings. The downtown business and industrial centers—usually set on low, soft ground—are the riskiest; residential areas in the surrounding hills are generally safer.

Main purpose of Dr. Richter's classification is to guide local

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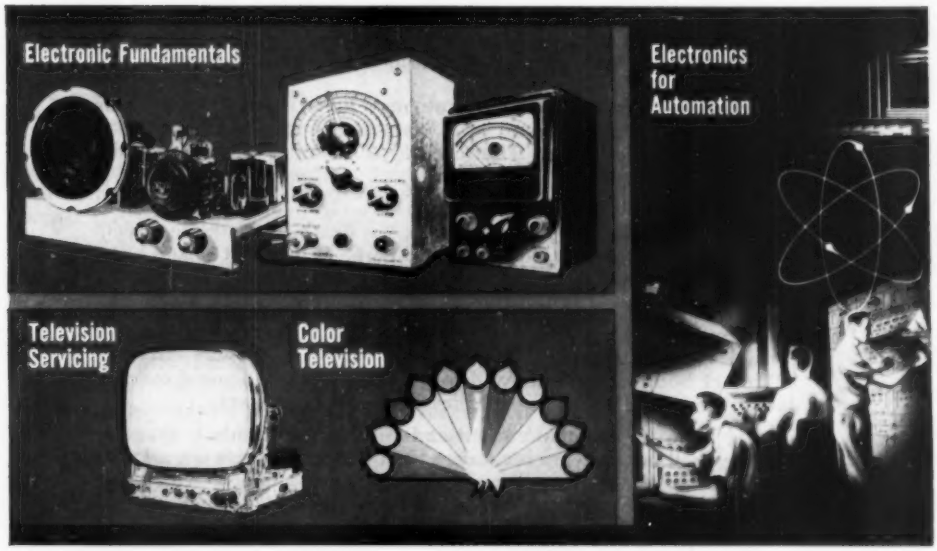

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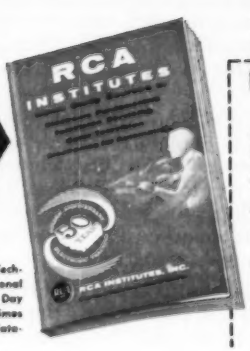

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officials in framing building codes and insurance men in setting rates. The big trouble, he says, is the large number of weak and dilapidated buildings. They are too flimsy to be safe under ordinary use, and just fall apart when a small quake hits.

Puppies, go 'way. You may be able to outwit the pet dog (female) who embarrasses you with the prospect of a litter of indeterminate breed: Give her a hefty shot of malucidin when you notice her interesting condition. The unborn puppies will disappear.

Dr. Leon F. Whitney of Yale Medical School found that malucidin reverses pregnancy in dogs. Literally reverses, too: The embryos are absorbed into the mother's bloodstream. In tests on beagles and coonhounds, the drug worked every time, even when administered only three weeks before the expected birth.

Would it work on humans? Dr. Whitney got good results with mice, but not with rats or rabbits. All he will say is: "Malucidin should be a boon in the elimination of unwanted puppies."

Germ warfare—against bugs. You may keep insects out of your garden by infecting them with bacteria and making them so sick they curl up and die. That's the idea behind a new insecticide.

It consists of spores—germs in the tough, dormant form that is ready to grow fast when conditions are right—of microbes called Bacillus thuringiensis. Thuringiensis is death on mothlike insects that munch cabbage, tomatoes and corn. It does not sicken bees, animals or fish. People have eaten the stuff without harm.

Another new bug killer does house pests in by drying them into mummies. It is an extremely fine silica powder—individual particles about .00004 inch across—that attacks the wax covering insect bodies. Tests show it to be very effective against roaches and termites, promising for flies, mosquitoes and ants.

Big hope for the dry-'em-out-and-kill-'em insecticide is that the bugs will not develop resistance to it. Insects possess remarkable ability to adapt: New breeds of bugs quickly evolve with body chemistry rejiggered to shrug off old poisons. The new insecticide gets around this because its action is physical, not chemical, and external, not internal.

Both these bug killers are still experimental, and are not yet on sale. The germ dust is called Thuricide (Stauffer Chemical Co., NYC); the silica powder is Dri-Die (W. R. Grace & Co., NYC).

Supersonic whips. Physicists, who several years ago got into a high-level mathematical hassle trying to explain the queer motion of a round-bottomed toy top, last year worked themselves up over bullwhips (also leather belts and wet towels). Reason: The characteristic crack of a snapping whip sounded suspiciously like a sonic boom—as though the tip had smashed the sound barrier to travel faster than sound.

They never did settle the top argument completely. However, a report in the Journal of the Acoustical Society says that the tip of a whip gets up to 950 m.p.h., well beyond the speed of sound. The snap is shock waves generated by the supersonic tip.

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Have you heard...?

Waiting at the end of the road. Harvard Medical School has devised a five-year plan to study car fatalities. Not just another lab stress-and-strain setup, this one's a "cradle to grave" project aimed at finding out what made the driver tick (or stopped his ticking). A 14-member team of psychiatrists, engineers, lawyers, physicians, mechanics—even a priest—will survey accidents as they happen.

Alerted by two-way police radio, four of the team will converge at the scene of an accident. An automotive engineer will check mechanical factors; a traffic engineer will note the flow pattern, speed limits, etc.; a 'human' engineer will study the car's size and structure in relation to the driver; a doctor will determine the driver's physical condition. Special autopsies will be arranged if necessary.

Social workers and psychiatrists will follow up with interviews of witnesses and next-of-kin, while lawyers and priests will ponder the legal, moral and ethical aspects. To qualify for an $810,000 Federal grant, Harvard worked up a number of test cases: Four of the so-called accidents turned out to be suicides; one, a possible homicide.

Revolution in appliances? Brighter and shinier than ever, the '59 appliance lines have appeared onstage. But appliance men are looking past the chrome lids to two developments, still in the wings, that threaten to steal the show—and may well end up revolutionizing the industry. Both are by Westinghouse:

- An ultrasonic sink. It uses high-frequency sound to clean pots and dishes.
- An electronic refrigerator. This is the "no moving parts" idea based on the "Peltier effect" of semiconductors [PS, Oct.].

They've applied the same principle to a cupboard dehumidifier as well. No more soggy snacks.

Most other '59 appliances stress looks and convenience. A few offer some functional improvements:

- Frigidaire's frostproofing system eliminates snow on frozen foods. Air loaded with heat and moisture from inside the refrigerator and freezer passes outside to the cooling coils. There moisture is evaporated by a condenser coil.
- GE's four-cycle-control dishwasher adjusts for delicate crystalware as well as heavy-duty crockery.
- GE has a Carboloy cutter in its Disposall. The waste cutter, says GE, is "almost as hard as a diamond."

For sheer convenience: There's an oven that pulls out and sheds its top for easy cleaning (Frigidaire) . . . another, with a temperature-control guard, that cooks meat to the desired doneness, then cools the oven to match and hold the meat's temperature (Westinghouse) . . . Look for the "programing" principle in more and more heavy appliances. In washers and dryers it means

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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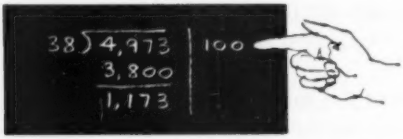
Have you heard...?

dialable water-time-spin-dry combinations to suit any load . . . For people who have just about everything else, there are shelves that swivel out or operate by pushbutton (GE), or tilt down (Westinghouse).

Has Junior's math looked weirder than usual lately? The reason: There's a new method of long division rampant, "Division by Estimation." It has at least two points in its favor: It's simpler, and it eliminates some of the old artificiality. Here's how it works:

Suppose you're dividing 38)4,973. Instead of saying, "How many times does 38 go into 49?" you estimate the whole answer: h.m. times does 38 go into 4,973—and, making life easy for yourself, you figure "at least 100" . . . So, to the right of the problem write "100," and underneath the 4,973 write the product 3,800 and proceed to subtract in the usual way:



You have now pared down the problem to a simpler one: How many times does 38 go into 1,173. Again you estimate. This time try 30 (the game being to pick numbers that are easy multipliers—with 0's for example). Repeat the process and check the result.

Ah-ha . . . the remainder now is less than the divisor—so you're through. Add up your estimates: 100+30=130, tack on your remainder (33/38), and there's your answer: 130 33/38. If your early estimates were too low, you just take a few more steps; if they're too high, you have to try again. Eventually you'll come out with the right answer. And the bright kids get to be pretty tricky guessers.

Man's latest space key: Brutus, the monkey. Known to his associates as "Brutus the Bored," the 12-year-old rhesus sits in his testing box day in and day out surveying a panel of flashing lights. In less than a month's time he's learned to make the appropriate sequence of key pressings to avoid a mild shock and to gain his piece of sugar. Purpose of the test is to train him for rocket travel. If he fails to respond to such sensory stimuli out in space, scientists might deduce that his hearing or sight had been impaired.

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

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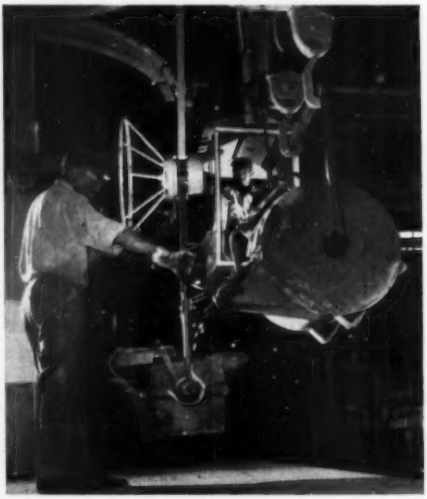

Playing marbles in a foundry

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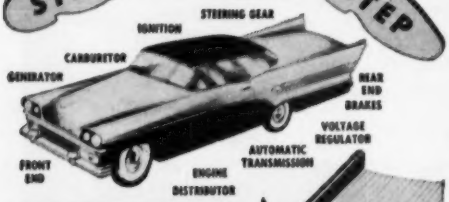

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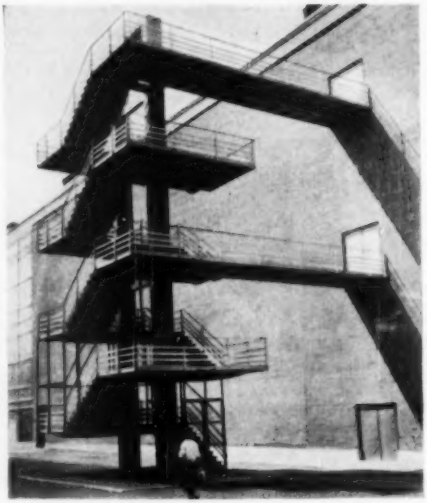

Fire escape gets modern touch

THIS artistic semidetached fire escape serves for emergency exit from a new exhibition hall in Dusseldorf, West Germany. It is the building's only fixed stairway; all those on the inside are escalators.

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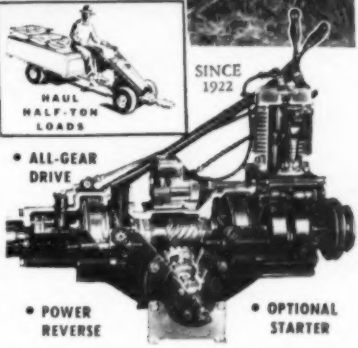

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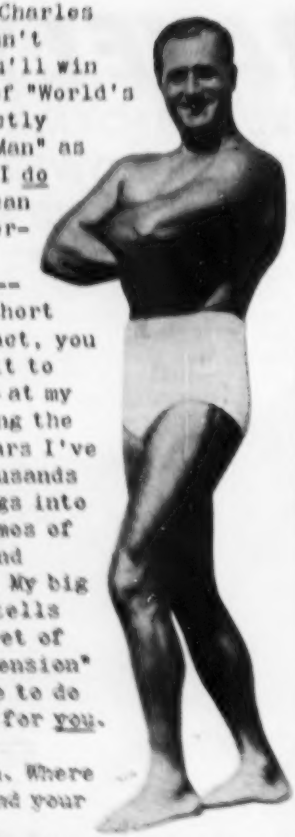

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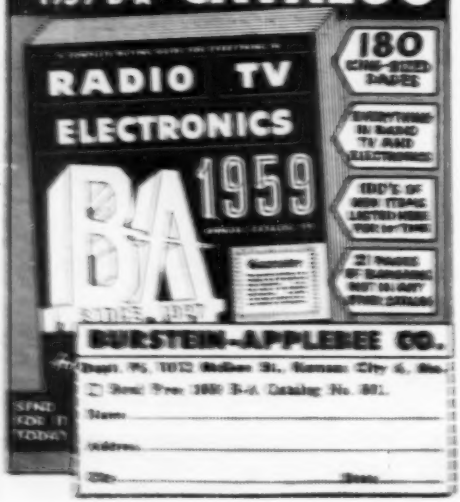

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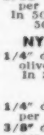
1¾" wide, 6,000 lb. test, per foot ..... 16¢
In 5, 6, 8, 10, 12 foot lengths.

12" and 24" Long All Purpose CARBIDE DRILL BITS



Now, drill thru deep concrete, wood, glass, brick, aluminum, fiberglass, plastics and steel with this amazing new all-purpose carbide drill bit. Fits any ¼" power drill. Drill can be sharpened 10 to 15 times. Special thin shaft permits drilled particles to flow freely from the hole without packing—drill runs "cool" eliminating brazing failures. Requires so little power that large diameter holes can now be drilled with smallest electric drills.

	12" SHANK	24" SHANK
5/16" Bit	$1.40	$1.75
3/8" Bit	1.60	1.90
7/16" Bit	1.90	2.25
½" Bit	2.45	2.75
9/16" Bit	2.75	3.25
⅝" Bit	3.25	3.60
	(All 6—$12.25 ppd.)	(All 6—$14.50 ppd.)

Precision Micrometers AT BARGAIN PRICES!

Chrome plated, adjustable equipped with ratchet stop and lock nut. Adjustable for zero. Decimal equivalents of fractionalsizes disunk on frame. Recessed frame to allow readings in tight spots Precision made for accurate readings, fully polished, in velvet lined case.

0-1", 1/1,000 Readings $5.95
1-2", 1/1,000 Readings with 1" test gauge $7.95
0-1", 1/10,000 Readings $7.50
1-2", 1/10,000 Readings with 1" test gauge $9.50

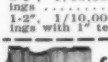
AUTOMATIC SIPHON PUMP

sensational low price $1.98 ppd.

Now—siphon any liquid automatically, safely, WITHOUT putting tube to mouth! Squeeze bulb, liquid starts to flow immediately! Transparent sections let you see liquid flowing! Siphons, pumps gasoline, water, any liquid. Even acids, corrosives! For cars, boats, power mowers, campers, plumbers, doctors, chemists, factories! Acid resistant. Over 7 ft. long!

ALSO AVAILABLE—Heavy Duty Siphon, ½" diameter tubing 8 ft. long ..... 2.98 ppd.

QUICKFIT Contour Marker



Amazing New Tool for Making to Fit Patterns to Any Irregular Shape!

A real boon to all Mechanics, Carpenters, Linoleum Layers and Do-It-Yourselfers! This handy new tool gives accurate measurements of hard to fit contours in an instant. Saves hours of time — assures perfect work without waste. Simply lay "Quickfit" against object to be fitted, push the sliding fingers into each groove or notch, scan lock—and presto, you have a perfect template to lay out your work. There are 19 solid lifetime aluminum "fingers" per inch—overall size 10" x 4¼" x ⅜". $5.95 ppd.

Full Range—Nos. 1-12 Quality Camel Hair BRUSHES

For Artists, Hobbyists, Homeowners

Superb quality brushes for every conceivable need from fine line work to broad brush strokes. You'll be amazed at the soft yet firm texture of these select brushes, each solidly set in metal grip to give years of use. Perfect for artwork, architects, touching up around the house, cleaning electrical and optical instruments and guns.

24 BRUSHES—2 ea. of nos. 1 thru 12— $2.00 ppd.

Drills and Saws Any Shape! SUPREME HOLESAW

Simply insert the amazing Holesaw into the chuck of your ¼" electric drill and you're ready to cut any shape you desire. Lower portion of Holesaw acts as regular ¼" drill which easily bores thru wood plaster, plastics, plywood and similar materials. Then, after penetration, the multiple keen cutting edges of the Holesaw, cleanly and speedily cut in any direction you move. Cut circles, triangles, zig-zags, any conceivable shape you wish—in seconds! $1.00

Send Check or Money Order. If COD, fees extra. MONEY BACK GUARANTEE

SCOTT MITCHELL HOUSE, INC.

Dept. E-3 415 So. Broadway, Yonkers, N.Y.

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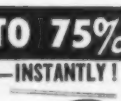
Automatic Faucet Water Heater



Automatically gives hot water from cold water tap. No installation cost. No tank needed. No waiting for water to heat up. No need to fill long risers with hot water and waste fuel. Just plug in, turn on the cold water, and in seconds you've got hot water for cleaning up, light laundry, washing dishes, shaving . . . or for hot coffee, tea, chocolate, instant soup. Consumes about 5c worth of current PER HOUR. Fully automatic operation—no need to pull plug when heater is turned off. Heater element can't burn out even though plugged in all the time. Equipped with pilot light. Landam automatic controls guarantee long life. Gives COLD water whenever desired. Weighs only 22 oz's. goes with you wherever you want hot water: shop, garage, farm buildings, warehouse, lab, motel, hunting lodge, summer cottage . . . **any place** that has electricity and running water! Full quality tested. FREE stainless steel adapter for threadless faucets. Complete with easy instructions—can be installed or disconnected in one minute! Available in 120 or 220 volts. AC ONLY. When ordering state voltage. $24.95 ppd.

Interesting—Educational—Easy-To-Build PORTABLE TRANSISTOR RADIO KIT

Complete—Nothing Else to Buy—No Soldering—Screwdriver Only Tool Needed

Here's a challenge and an opportunity for every youngster to build a quality, portable transistor radio that is guaranteed to give amazingly clear reception even from distant stations. This is not an ordinary "crystal set" but a carefully engineered unit utilizing the Germanium Diode developed for radar plus the Transistor for superior amplification of sound.

A screwdriver is the only tool needed. It's simple as follow the step-by-step assembly instructions. The kit contains all necessary components plus a "Trans-Assembly Template." Gift boxed.

• Penlite Batteries—Last 1000 hours • Simple to Assemble • Personal Portable Radio with Case • Complete with Professional Earphone • Guaranteed To Operate $7.95 ppd.

NOW! A Precision, Professional, Portable . . .

PAINT-SPRAYING OUTFIT!

A Real Compressor . . . Not A Vibrator!

Sprays paint, enamel, stain, varnish, multicolor paints, insecticide, etc. For houses, garages, fences, screens, window trim, outdoor and unfinished furniture. Ppd. Only $39.95

A homeowners' precision-built complete spraying outfit—with integral ¼ H.P. motor-compressor unit, guaranteed unbreakable one-piece nylon gun body, FULLY adjustable spray—manufactured to the highest professional standards. You don't need experience or "knack"—even a child can properly use it.

ATOMIZES paint in an accurately controlled pattern—adjusts from small-as-a-dime to a fan 10" wide. Sprays oil, latex base, water soluble and multi-color paints; stains, lacquers, enamels and varnishes; wax, waterproofing and moth proofing; insecticides, fertilizers and disinfectants. Inflates rubber toys. Easier to clean than a brush—paints 4 times faster!

Never needs lubrication; has aluminum die-cast body; can run off any regular extension cord; has 120 V universal AC/DC motor with thermostatic overload protection. Compressor weighs 6½ lbs. Outfit includes 2 wire 6 ft. cord with plug, 8 ft. of hose, easy-to-use 2 finger trigger gun.

ONE YEAR FACTORY WARRANTY!

New, Improved ELECTROSTATIC VENTILATOR

"Lets You Breathe Scientifically Filtered Air"

Imagine—for just about a penny a day you can have Dust-Free, Draft-Free, Comfortable Ventilation—24 hours a day—365 days a year! Ingenious Electrostatic Ventilator keeps out dirt, dust, smoke, smog, sleet—keeps curtains, drapes and furnishings clean—eliminates smoke nuisance—eliminates drafts and improperly ventilated rooms. Consists of adjustable rust-proof aluminum frame with 2 layers of aluminum mesh cloth separated by washable plastic filter medium containing a life-long electrostatic charge "born" into it. When air passes thru, an additional electrostatic charge builds up the way it does when you pass a comb thru your hair. This attracts dust particles the way the electrified comb picks up bits of paper. A "must" for Home, Church, Office and Industrial Plants!

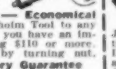
Adjustable To—	
15" to 25" ..... $3.29 (7" high)	29" to 53" ..... 4.95 (7" high)
22" to 39" ..... 3.95 (7" high)	22" to 39" ..... 5.49 (11" high)
	29" to 53" ..... 6.49 (11" high)

ELECTRIC PAINT SCRAPER

No matter how many layers of old paint, cellulose or varnish on any surface, this amazing electric scraper will cleanly remove it all—**instantly!** Does away with old-fashioned dangerous blowtorches and chemicals—guarantees against burnt woodwork! Just plug into any AC or DC outlet and you're ready to cut hours of labor into minutes. Imported from England. Ideal for professional and amateur. Complete with nine feet of heavy duty wire. 110 volts.

Reg. $15.00— Our Price $9.95 ppd.

Save $100 on Stockholm TORQUE ADAPTER



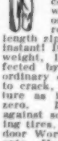
Makes an IMPACT WRENCH Out of Any Drill! Accurate — Quick — Economical

By attaching Stockholm Tool to any power drill socket, you have an impact wrench costing $110 or more. Torque controlled by turning nut.

One Year Factory Guarantee

¼"—Zero to 120" lbs.—$7.95 *25c pp. & hdlg.*
⅜"—Zero to 540" lbs.— 9.95 *25c pp. & hdlg.*
½"—Zero to 960" lbs.—12.95 *25c pp. & hdlg.*

Smoke Vinyl COVERALLS



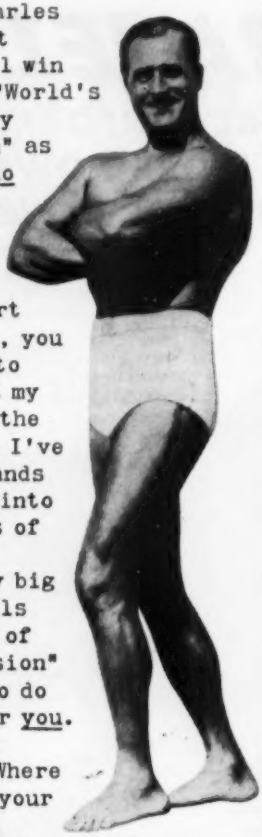
In Handy Fold-4 Way Pack

One of the most comfortable, toughest wearing coveralls available anywhere! Custom designed one piece, roomy cut tear-resist construction. Full length zipper—goes on and off in an instant! It's rugged, durable, lightweight, 100% waterproof! Not affected by oil, grease, mildew or ordinary chemicals. Guaranteed not to crack, stick or peel in temperature as low as 30 degrees below zero. Indispensable protection against soiling clothes when changing tires. Ideal for Fishermen, Outdoor Workers, Gas Station Attendants, Hunters, Farmers, Deliverymen, Golfers, Gardeners. Specify small, medium or large ..... $3.98 ppd.

NEW LOW PRICE! 13-Pc. Metal Index Chrome Vanadium Drills

Just imported from West Germany, these 13 precision Chrome Vanadium Drills, from 1/16" thru ½" by 64ths are set in a two-sleeve steel, indexed container for easy and instant selection. Full jobber length shanks. Easily and cleanly bite through toughest steels, woods, plastics, iron and aluminum. Unconditionally guaranteed. *Add 15c pp. & hdlg. Only.* $1.98

My name is Charles Atlas. I can't promise you'll win the title of "World's Most Perfectly Developed Man" as I did. But I do believe I can make a powerful He-Man out of you -- in a very short time. In fact, you can prove it to yourself -- at my risk. During the last 30 years I've turned thousands of weaklings into human dynamos of strength and endurance. My big free book tells how my secret of "Dynamic Tension" may be able to do such a job for you. No cost or obligation. Where shall I send your copy?



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Mail coupon now for FREE 32-page book. Tells how I can give you "Stand-Out" muscles—how "Dynamic Tension" can make you a new man—confident, popular, successful. See actual photos of men who became "Atlas Champions." Read answers to vital questions about your health, your personality, your future. Rush coupon to me personally: **CHARLES ATLAS, Dept. 1C, 115 E. 23 St., N. Y. 10, N. Y.**

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1/16" dia., 100 lb. test, per ft. ..... 1½¢
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3/16" dia., 500 lb. test, per ft. ..... 2½¢
In 50, 100, 200, 300, 400, 500 ft. & over lengths

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1/4" dia., 1000 lb. test, olive drab, per ft. ..... 3¢
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1/4" dia., 1200 lb. test, per ft. ..... 7¢
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All in any length up to 1200 ft.

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Perfect for passenger safety belts, luggage straps, car tow-lines, car carrying straps, boat trailer straps, etc. Tie heavy equipment and machinery with greater ease and safety — at far less cost. Just the thing for the garage or workshop.

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In 5, 6, 8, 10, 12 foot lengths.

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	12" SHANK	24" SHANK
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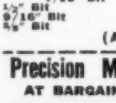

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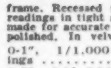

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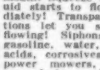

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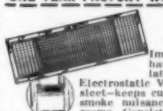

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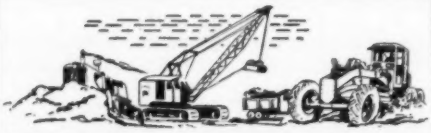

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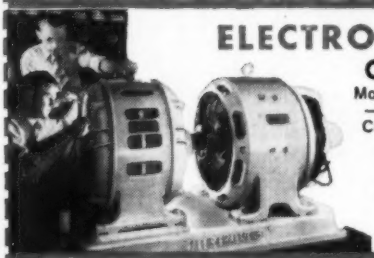

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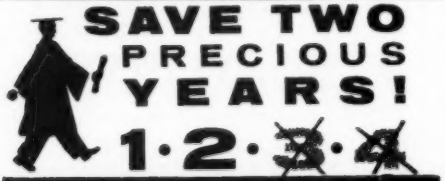

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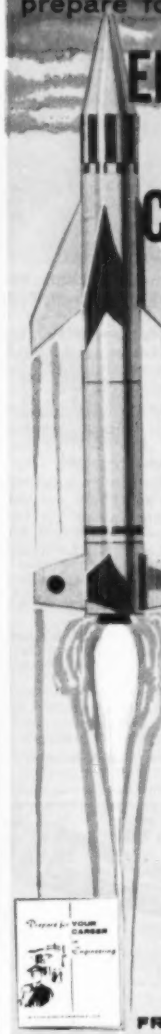

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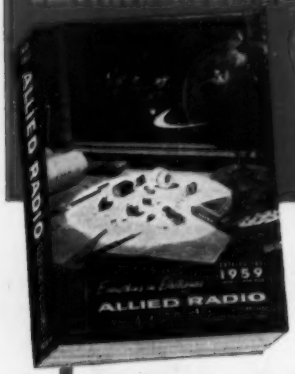

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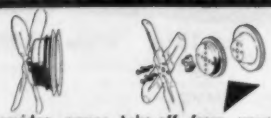

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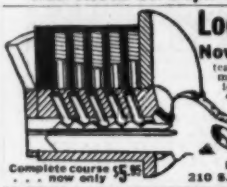

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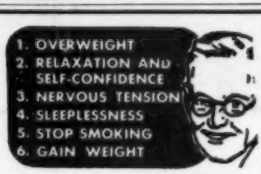

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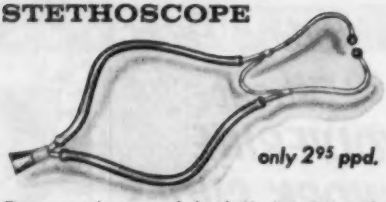

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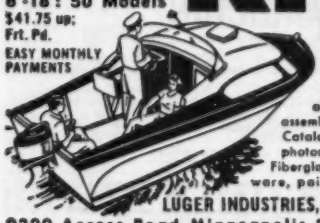

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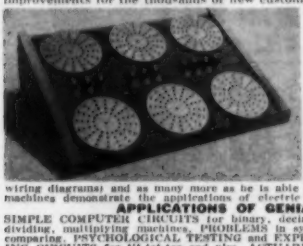

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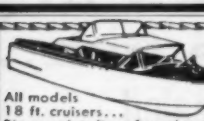

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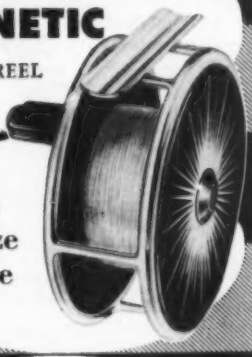

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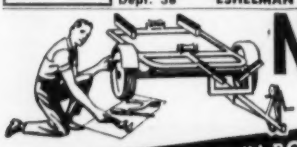

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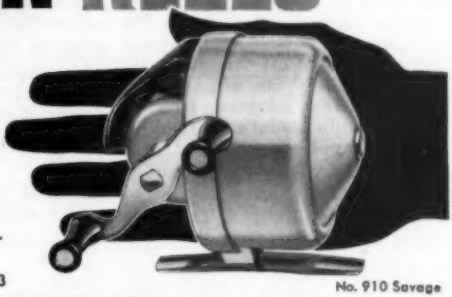

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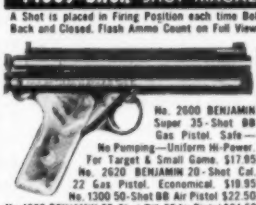

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Abort (as in "aborted flight"). The failure of a rocket to function properly.

Alcohol. Not the 90-proof stuff but ethyl or methyl alchohol, which is used with liquid oxygen as a propellant.

Apogee. The point farthest from earth in the orbit of a missile or satellite.

Asteroids. Numerous small planets revolving around the sun, now joined by a Russian-built fellow traveler.

Auntie. Nothing female, but slanguage for "antimissile missile."

Backup. A substitute rocket, to save time in the event of a failure.

Bird. Inanimate objects that fly: missiles, satellites, etc.

Blow-down tunnel. A wind tunnel that operates by releasing gas from a tank.

Capsule. A fancy term for the cockpit in high-speed aircraft and space ships.

Decay. Space talk meaning loss of energy, when referring to an orbiting satellite.

Dog house. The mound-like housing for instruments outside a rocket.

Destruct. The deliberate exploding of a missile after it has been launched.

Exotic fuel. A fuel with a high energy content.

Free radical. An atom or group of atoms broken away from a stable compound by application of external energy.

Gantry. Special crane or scaffold used in missile launchings.

Grain. Body of a solid propellant used in a rocket. It is shaped to burn without surges.

Hardware. Pieces of finished equipment for a space ship—air frame, motor parts, instruments.

Hydrasone. One of the exotic fuels.

Hydrocarbon fuel. Fancy term for gasoline or kerosene.

Ionosphere. The outer region of the atmosphere beginning about 25 to 50 miles above the ground, depending on the theory you prefer.

Ion engine. A space-ship engine in which the thrust is obtained from a stream of ionized atomic particles.

Kill. Destroying a missile or enemy aircraft.

Launch pad. The steel-and-concrete base from which a missile is launched.

Light year. Some 6,000 billion miles (the distance light can travel in one year's time).

Lox. Nothing nutritional—short for liquid oxygen. Explosive.

Magnetohydrodynamics. A tongue-twisting combination of several existing words to describe the study of the interaction between magnetic fields and electrically conducting fluids and gases.

Moon suit. Inflatable coveralls worn for high-altitude flights and space tests.

Nozzle block. The throat of a wind tunnel, which regulates air flow and velocity.

Oxidizer. A substance, generally lox, that combines with a fuel to produce heat and gas.

Perigee. The point closest to earth in the orbit of a satellite.

Photon engine. A rocket engine that gets thrust from a stream of light rays.

Pick-up. Not what you think, sir! It's a sensing unit that picks up and measures temperature, pressure, velocity, etc.

Re-entry. Whenever a space craft comes back into the earth's atmosphere, it is "re-entering."

Relaxation time. Not a planetary coffee break, but the period of time necessary for material to return to normal state following stress or temperature change.

Satelloid. Half airplane, half satellite, designed to orbit, then return to earth.

STOL. Short for Short Take-Off and Landing.

Troposphere. The lower area of the earth's atmosphere.

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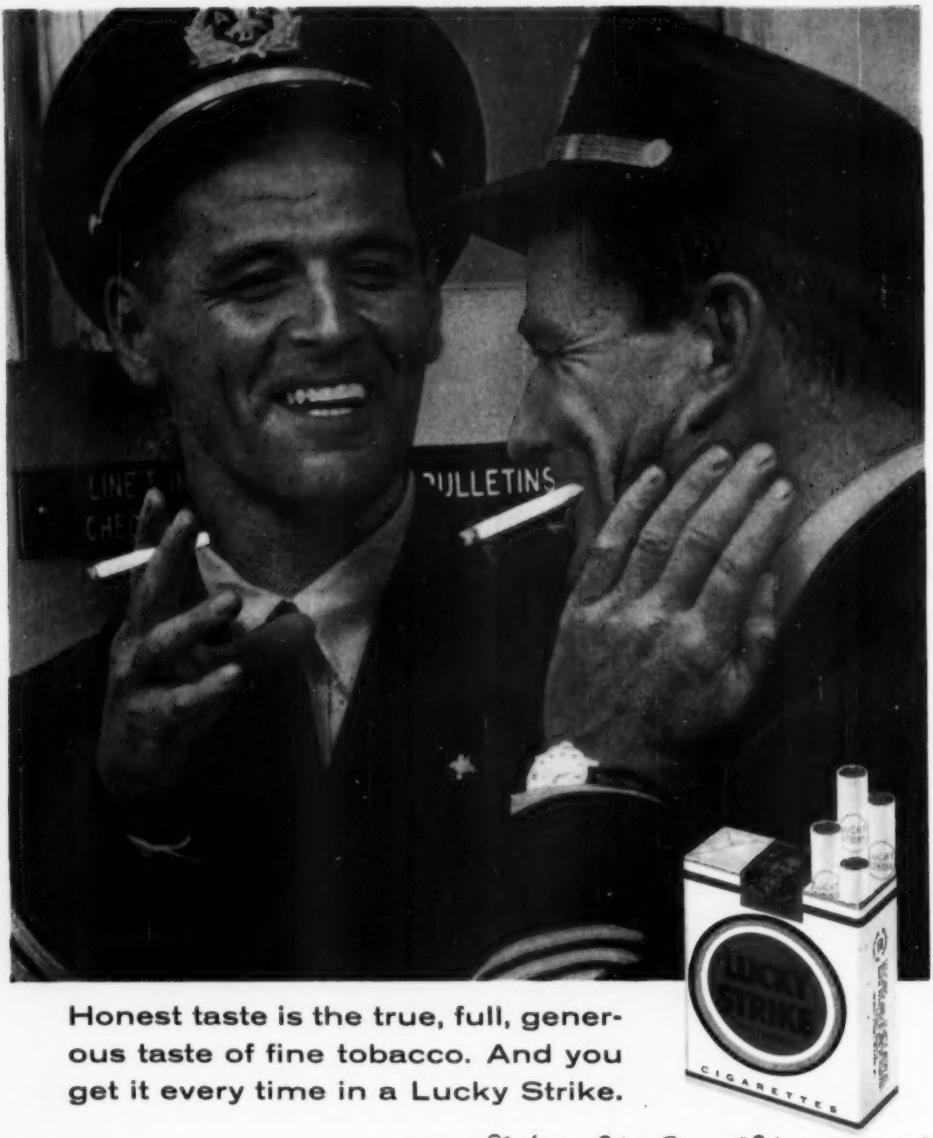

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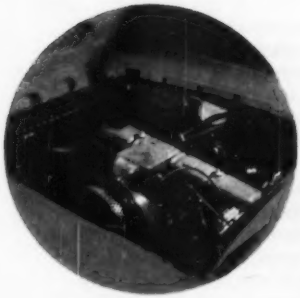


FORD

What You Save by Driving a SIX

CHEVROLET

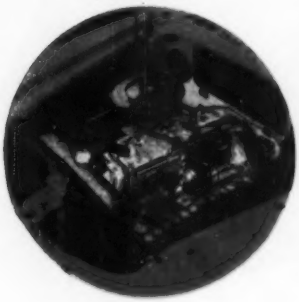
Test of four '59 sixes finds them slower at top speeds than V-8s, a bit noisier, but surprisingly lively, with a bonus of gas and repair savings

By William Carroll

PLYMOUTH

THE sixes are staging a strong comeback. While they don't yet have the V-8s on the run, they are pressing. Last year more than a third of all Detroit Big Three cars that were sold had six-cylinder engines. This was in startling contrast to the previous year, when less than a quarter of the same makes were built with sixes under the hood.

It's no secret that fleet operators buy sixes by the thousands. Or that many police departments use them for city patrol work. Or that taxi operators like them for their better fuel mileage in traffic. Should the rest of us go by fleet experience in buying personal cars? How good is a modern six in everyday driving—on the expressway and in the country, as well as in city traffic?



DODGE

The answers. To find out, we set up identical tests of four 1959 six-cylinder sedans—Chevrolet, Ford, Plymouth and Dodge. We tried and failed to find that 1959 freak—an Edsel six. And, because they had been extensively tested for December POPULAR SCIENCE, we excluded Rambler and Lark. Beginning at the same time on each of four mornings, we drove each car over an identical 275.5-mile course, holding to the same average speeds over each leg. The course was chosen to include heavy traffic, freeways, steep mountain passes, rough dirt roads, and desert highways. We measured fuel consumption on every mile for each car.

The sixes as a group. What's it like to wheel 3,500 pounds

A new six gives you two to five more miles per gallon . . .

Test cars were gassed from the same pump, filled to a mark in the filler neck.

of car behind an economy engine? Surprisingly good—and it might seem even better if you didn't know there was a six under the hood. (Passengers who weren't told had no idea the cars were sixes.) But I did notice that all the cars were noisier than their V-8 opposite numbers. You soon get used to the extra engine noise in traffic; in the country you remain aware of it.

Highway performance, in general, is satisfactory for normal driving. But as for high speeds, the sixes simply don't have it. They seem to peak out around 85 m.p.h. true, whereas their more muscular brothers readily top 100 m.p.h. It's probably more important that at 45 m.p.h., there's only about 10 percent difference in horsepower and torque between comparable sixes and eights. But it is also true that, in the ranges above 70 m.p.h., the six-cylinder jobs have little to spare.

Now for the specifics.

Chevrolet. The best gasoline mileage of the four cars I drove was racked up by the Chevy six. This was true at all speeds and traffic conditions. The engine started quickly and idled easily, and its three-speed manual transmission had the right ratios to stay with traffic. I didn't win any green-light races, but neither did I hold anybody up. Ride and handling were satisfactory, though there was considerable lean on hard turns. It's hill climbing was good, though not quite up to Plymouth's. The car had the typical GM feeling of solidity, even when bombed along washboard dirt roads.

Ford. This sedan had the best-finished interior of the four we drove. But it had its drawbacks, too. Whether warm or cold, the engine was slow to start. And while there was power enough, the engine seemed to labor at anything below 20 m.p.h. in high. I found the shift linkage stiff and awkward at first.

On open highways the Ford would move briskly enough, but it seemed a little light on passing punch when oncoming cars claimed their share of the road. Handling on good roads was fine, with neither wind-wander nor the need for constant correction, but it fell off somewhat on rough sur-

Each car carried a calibrated mileage meter, cut into the fuel line. Every drop of gas was measured and controlled. At right, a mileage meter hangs from the door glass. It can measure the exact distance traveled on a tenth of a gallon of gas.

It's easier to work on and cheaper to keep in new parts

faces. Neither hill climbing nor fuel economy were strong points of this particular car. Up miles-long Cajon Pass, its maximum speed was 60 m.p.h., and it was drinking gas at the rate of 10 miles to the gallon in the climb. Our other sixes went up the same grade faster on less fuel.

Plymouth. This six felt good in traffic, because the engine showed enough low-speed torque to lessen the need for frequent shifting. Though I trimmed no V-8s that were really trying, the Plymouth six showed enough pep to stay right along with a fast-moving crowd. In the country I found that road handling was the best of the four cars, good on both smooth or rough surfaces. Hill climbing was also the best of the four. About all that I found to criticize was the fact that the front-end sheet metal didn't seem well braced; it weaved more than that on Ford and Chevy during fast travel on bumpy roads.

Cresting a 32-percent grade, the Dodge Six, shown above, was slowest, 15 m.p.h. Plymouth and Chevrolet did it at 25 m.p.h.

Dodge. This was the only six driven that was paired with an automatic transmission. It didn't make a happy combination. Even though the car had better sound insulation than its low-priced brothers, the engine wound up noisily when you opened the throttle in traffic. It seemed to me that it was overgeared, or that the shift points were set too low. Highway travel was pleasant and both curves and rough roads were taken in style. But hill climbing was not a strong point; in the mountains the gearbox would downshift and upshift constantly in an effort to keep you going at a reasonable speed. On the 32-percent grade the car was extremely slow, and my two passengers seemed at least one too many.

Comparing the engines. Some interesting comparisons can be drawn from the engines of these sixes. Chevy gets 135 hp. at 4,000 r.p.m. from its ancient but frequently reworked overhead-valve engine. Plymouth and Dodge get 132 hp. at 3,600 from the old flat-head six that they've run for years. Ford and Edsel claim 145 at 4,000 from a newer but by no means brand-new OHV job. The torque figures don't vary appreciably among the four engines.

Each car was taken over miles of rough dirt roads to determine handling qualities under such conditions. This is the Plymouth.

What is important, perhaps, is that the overheads don't put out peak torque until they are turning at the equivalent of roughly 50 m.p.h. The flat-head in Plymouth, however, peaks in torque down near 30 m.p.h.—which accounts for the lesser shifting in traffic. One compensatory drawback—though not a serious one—is that piston travel per mile is a bit greater in the long-stroke flat-head engine.

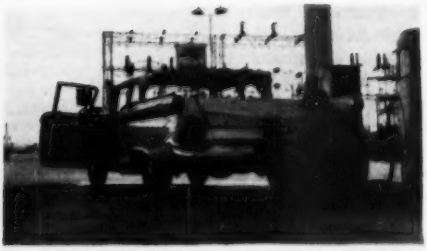
If you shop by the pound, it may surprise you to learn

'59 sixes road-tested by PS: Which is best for you?

	Miles per gallon at steady speeds						Miles per gallon on 277.5-mile test-run	Seconds to climb 32% grade in low gear	Speed at top of 32% grade (m.p.h.)
	30 m.p.h.	40 m.p.h.	50 m.p.h.	60 m.p.h.	70 m.p.h.	80 m.p.h.			
CHEVROLET	27	26	23	21	18	14.5	20.3 at 45.6 m.p.h.	23.6	25
FORD	20	21	19	17	14	12	16.4 at 45.1 m.p.h.	28.5	20
PLYMOUTH	26	24.5	21	19	17	14	19 at 44.1 m.p.h.	22.7	25
DODGE (automatic transmission)	24	25	24	20.5	17	14	16.9 at 44 m.p.h.	35.9	15

that Ford is the lightest, with Dodge, Chevrolet, Plymouth and Edsel following in that order. The brake-lining area by pound of car weight shows an unexpectedly big range: Edsel trusts 22 pounds to each square inch of lining; Ford and Plymouth load somewhat over 19, Chevy about 18, and Dodge an impressively low 17-odd pounds.

Do sixes really save money? They certainly seem to. The average cost is $120 less than a V-8 of the same make and model. Which means about $15 saved on taxes and finance charges. Then your first cost may also be lowered if you decide to do without power steering and power brakes (sixes are a trifle lighter on the front wheels) or an automatic gearbox (which isn't as happy with a six as with a V-8).



Ford six pauses in test run to refuel at a Mojave Desert pump. Under the hood, Ford and Edsel sixes are identical.

Your savings continue: You can look for maybe two to five more miles per gallon—and it'll be regular gas, not that three-and-a-half-cents-extra stuff that most V-8s learn to lap up. Finally, you save on maintenance and repairs. Sixes are easier to work on, and cheaper to keep in new parts. Example: A reconditioned carburetor for a six can be bought for $15, whereas a four-throat V-8 job can set you back a solid $50. And it's reasonable that sixes won't insist on so much garage time: They are easier on clutch, drive line, and tires; and they don't tumble out of tune as easily as do more sensitive power plants.

A licking on trade-in? The old story used to be that "sixes are worthless as trade-in cars." We checked at several wholesale auto auctions and found that now, at least, there is no truth in it. Depreciation varies by make and year, of course, but in general the depreciation of fairly recent sixes has been no worse—and sometimes it's even better—than that of V-8s.

Can you walk in and buy? I checked a number of dealers and found very few sixes on display. The reason seems to be that dealers stock a six or two so they can advertise low

Power plants and prices: How the new sixes compare

	Price	Horsepower at r.p.m.	Torque at r.p.m.	Bore and stroke (inches)	Displacement (cu. in.)	Compression ratio	Engine design
CHEVROLET	$2,247	135 @ 4,000	217 @ 2,000	3 3/16 x 3 5/16	235.5	8.25:1	OHV
FORD	$2,219	145 @ 4,000	206 @ 2,200	3 5/8 x 3 3/8	223	8.4:1	OHV
EDSEL	$2,545						
PLYMOUTH	$2,232	132 @ 3,600	205 @ 1,200	3 1/4 x 4 5/8	230	8:1	Flat head
DODGE	$2,515						

prices, but they'd naturally rather sell the more profitable V-8s. So you'll find them, when you do, nailed to the ground in back lots or buried behind rows of loaded gook wagons. Chances are that the salesman will work at "up-grading" you to a V-8, perhaps pointing out that you can drive this lovely V-8 home today, whereas you'd have to wait for a special order to come through on a six. To get what you want takes only firm patience.

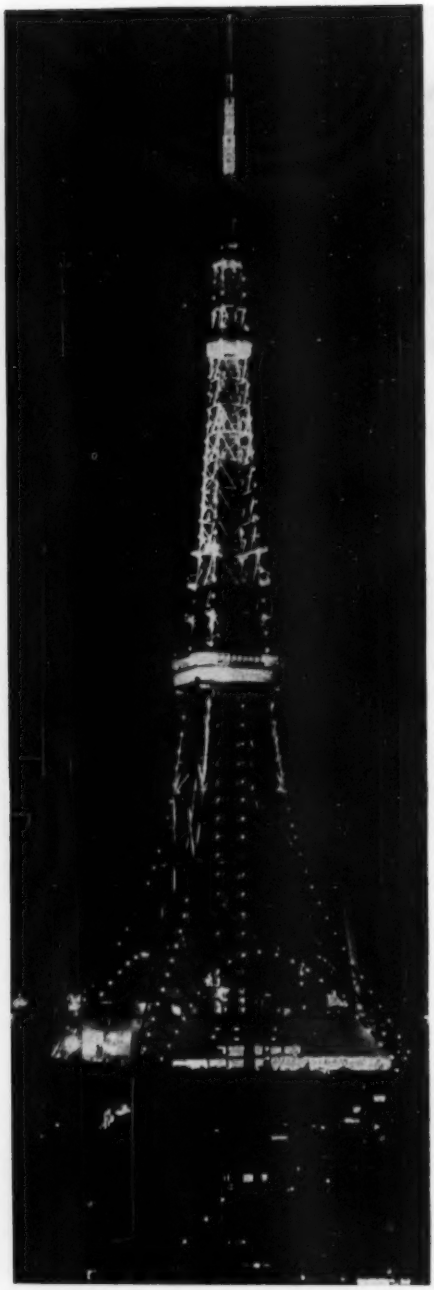
The sixes were tested at altitudes ranging from sea level up to Cajon's 4,255 feet.

Does a six make sense? This depends, obviously, on the answers to a lot of special questions: where you drive, for what purpose, in what way, even what kind of person you are.

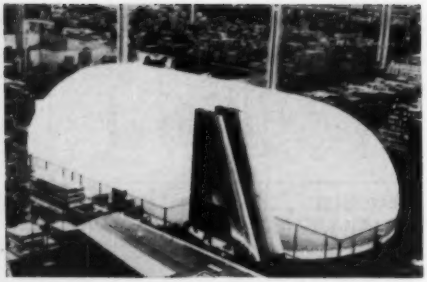
First, what's wrong with them? Plenty, if you drive in hilly country, if you haul a boat trailer, if you like to load the family and plenty of gear in back and just take off. You *could* do these things in a six but it might not be much fun. With heavy loads, on steep hills, and at fast touring speeds, you are apt to find when you push down hard that there's nothing much under the throttle but a firm floorboard.

On the other hand, it seems to me that the six is almost ideal as a commuting car, a business car, or one for the usual run of school trips, shopping, and home errands. The six is also good, though perhaps just a trifle less so, as a second car in the family, paired up with a high-performance sedan or wagon. (I make that partial qualification because some small-car buffs would argue that a six isn't a big enough step in the second-car direction.) Third, a six makes great good sense if operating a standard-size car at the lowest possible cost is important. If you drive average passenger-car mileage each year, you can figure that a six will cost you about $120 less a year than a V-8. Worth thinking about, isn't it? END

At the end of the 275.5-mile run, three of the four sixes line up for a wash.



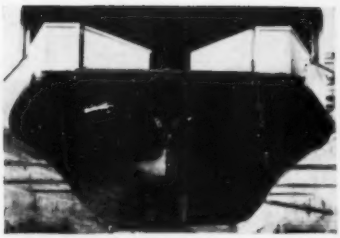
ORIENTAL EIFFEL. Higher than the original—1,092 feet to 984—this Tokyo TV tower bears a strong resemblance. During its first two opening days, 28,000 people visited its observation levels.

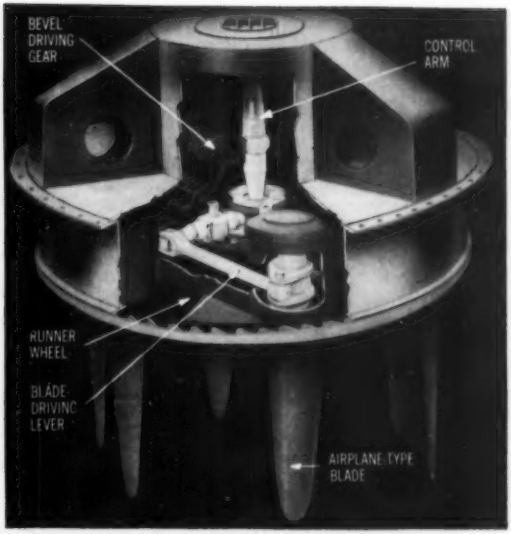


INSIDE BUBBLE. The blown-up nylon tent above is pitched in the middle of the big Lockheed plant in Georgia. It gives privacy to a team developing techniques for building the tri-sonic B-70.

SUN VIEWER. This RCA-built TV camera will help astronomers see the sun more clearly this summer. Mounted on a telescope in a balloon 80,000 feet up, it will assist in focusing from the ground.

HANDMADE CAR. Here's an auto that never saw an assembly line. The 35-hp. Moretti is hand-assembled in Italy. It will do 90 m.p.h., go 38 miles on a gallon of gas. Cost: $2,495 in New York.





STEERING PROP. A German propeller resembling a paddle wheel on its side develops thrust like a sculled oar. It steers as well as drives the ship ahead or astern without changing direction or speed of rotation. At stern, center or bow, it's used on ferries (above), launches, tugs.

NUCLEAR FIRE ALARM. Radium radiation from these cylinders ionizes combustion gases, registers on a control box (right). The Pyr-A-Larm detectors are spotted strategically in a building.

BLOW-UP BOAT. Packed in a duffle bag, this inflatable British boat takes little space, weighs 23 pounds with paddles, thwarts and a transom for a 1½-hp. outboard. It carries three people.

DRIVERLESS TRACTOR. Pickup coils straddling an underground wire guide this farm vehicle built in England. It can follow a fixed route, stop at animal-feeding points, unload fodder without aid.

THE OCTOPUS:

Nature's Phony

The "terror of the deep" is actually a timid, harmless creature—with a high I.Q.

By Gardner Soule

Villain

HENRY J. BRUCE, a British naval diver, met his octopus off Gibraltar. Forty feet down, he stooped to pick up a pair of overalls on the bottom. The overalls rose and danced.

When octopus arms thrust out and the suckers gripped him, Bruce was terrified. But not too terrified to forget his knife. It worked. A stroke between the eyes—the standard thrust prescribed for divers—destroyed the animal's brain. The tentacles relaxed. So did Bruce—after he had himself hauled up.

Bruce's story is typical. It shows what happens almost every time a man encounters an octopus:

- The octopus scares the daylights out of him.
- The man is almost always unscathed.

A streetcar full of passengers once met an octopus—right in the car.

The car was on a supposedly quiet run, in one of Britain's Channel Island towns, when the cephalopod was spotted. He was taking a seat in the car.

What was worse, the seat was occupied. The octopus was wriggling into the lap of a passenger. The passenger screamed and dissolved into hysteria.

One man aboard was not terrified. Dr. Alan Stephenson, a marine zoologist, owned the octopus. He had been carrying it in a wicker basket. He retrieved the animal and laid it back inside.

Fear of the octopus is needless. That is the unanimous conclusion today of teuthologists (octopus scientists). "In my opinion, they're virtually harmless," says Kenneth Norris, curator of Marineland of the Pacific.

"I don't know of an authentic case of a man killed by an octopus," James W. Atz, associate curator of New York City's new aquarium told me.

There you have it: In spite of everything you've heard or read, there has never been a single proven instance of an octopus killing a man. Atz has one word he says describes the cephalopod best: timid.

Why, if the octopus is the world's biggest false alarm, does it cling to its position as the world champion frightener

Even after capture, an octopus keeps running away. With no skull or bones, he can slither through a crack.

of men? N. J. Berrill of McGill University, Montreal, believes one reason is that it looks like a nest full of snakes. "Snake shape," he says. "Men are allergic to that shape." Then there's another reason for octopus scares, Berrill explains: "Tall tales. Tall tales that are mostly untrue."

In 1866 the tallest and most untrue tale of all gave the modern world its concept of the octopus. Victor Hugo, in a novel, drew on his vivid imagination rather than on scientific facts: "No horror can equal the sudden apparition of the devilfish, that Medusa with its eight serpents." "A glutinous mass endowed with a malignant will." And so on, for 20 pages.

Hugo's book, *Toilers of the Sea*, was a smash hit. Thousands read it. Famous French restaurants served with special sauces the creature that Hugo had described as "a monstrous embodiment of disease" with "gangrened and scabrous flesh." Paris milliners created an octopus hat so French mademoiselles might add to their charms by wearing replicas of the creature Hugo called slimy and loathsome.

Hugo won some praise from teuthologists because, by his Frankenstein prose, he did something no other man has ever done. He made the octopus popular. But

Hugo said the octopus drank human blood, ate human flesh

teuthologists, who today are working to restore the octopus' popularity, had second thoughts about Hugo when they realized how untrue his tall tales were.

"He who writes these lines, has seen with his own eyes at Sark (in the Channel Islands) an octopus swimming and pursuing a bather," Hugo wrote.

If Hugo saw that, teuthologists say, he is the only man who ever did.

"This is the most obvious misconception," says Kenneth Norris of Marineland. "They're very retiring, shy creatures. For a swimmer, the danger of being attacked by an octopus in American waters, on any coast, is about as great as the danger of being blown up by an exploding pumpkin in a cornfield."

An expert's testimony. Norris, 35, who makes five hunting (or fishing) trips a year around California coastal islands, sometimes skin-diving, would give anything if only the octopuses would come after him. Instead, they run away into

The owner of the octopus retrieved the creature, laid it back inside the wicker basket, and the fright subsided.

crevices in rocks or in shell beds or in burrows on the sea floor.

They are extremely clever at hiding: They often build their own homes by moving and stacking rocks and shells and excavating the sea bed by means of their ability to jet water. Then they go inside and close the door by hauling a rock or shell after them.

If they can't take shelter, they hide by changing to any of an incredible spectrum of colors to match almost anything around—yellow, brown, white, maroon, gray, pink, striped or dotted—even blue, green or transparent to blend with the water. In extreme cases, they squirt their ink. Brown or purple, it hangs briefly in the water in the startling silhouette of an octopus to let the real quarry escape.

As the octopus usually eludes him while skin-diving, Norris often finds himself trying something else. He lowers to the bottom an octopus doghouse. This is a cave-like coffin with an opening that, he hopes, an octopus will climb into. If one does, he has difficulty, on the deck of his boat, in getting the timid creature out. It usually won't come voluntarily. Norris tosses in a starfish. The starfish has claws on its back, and pinches the cephalopod, which then emerges. Norris puts the octopus in a tank of iced sea water for the short trip to the Marineland aquarium.

Octopuses are escapists. Even after capture, they keep running away from men. For 30 years, this habit of theirs has plagued Christopher W. Coates, head of the New York City aquarium. The octopus that rode the street car shows one way they do it. Possessing no skull and no bones, an octopus is almost all muscle and flesh. He has an incredible ability: He can flatten himself almost to the thinness of a sheet of paper and slither through a crack you can scarcely see. The street-car rider thus had oozed out of the wicker basket under the tightly closed top.

Coates has had octopuses escape from nailed-shut cigar boxes and from cages of ½-inch wire mesh. In tanks, aboard ship, he had something else happen: They got seasick. Like you, an octopus when seasick wants to die. Unlike you, the cephalopod often does.

They're hard to fool, too. Even in the aquarium tanks, Coates's timid octopuses continued to hide—this time from the public—either in the rocks in their tanks, or by protective coloration. People saw the sign "octopus" and nothing else. Coates received protests. He knew octopuses, nocturnal, normally are active only at night. To get them to move instead by day, when the crowds were on hand, he darkened their tanks, left on

. . . Nonsense, he eats crabs

only a blue light. This did not fool a single octopus.

Like the critter aboard the streetcar climbing into a lap, and like all octopuses, Coates's began to climb. An octopus can climb, walk and swim with ease. In New York City they climbed right out of their aquarium tanks into the nearby bay.

Thinking he had none left, Coates drained the tanks. He found six, beneath some coral. They had hidden—even from him.

Octopuses prefer sea food. Victor Hugo said the octopus drank human blood and ate human flesh. This is plain nonsense. What the octopus eats is mostly crabs. It also consumes fish, crustaceans, worms, scallops, mussels, clams, other octopuses and, in emergency—often just before death—parts of its own arm-like tentacles.

In turn, it is eaten mainly by large eels (Moray and conger); by whales, seals and sharks; and by men, especially in Asia, Africa and the Mediterranean region.

"It has a flavor like shellfish," says Ken Norris. "Very good. But it's a problem to dislodge the sucker disks from the roof of my mouth."

Octopus meat can be tough. "I chewed a single tentacle the greater part of a morning," said another scientist. Natives have learned to beat the octopus to tenderize it. In Hawaii, old washing machines are used for the purpose.

Hugo made it out that his octopus, a resident of the Channel Islands, was a huge monster capable of drowning a man. Actually, a few cephalopods around there sometimes have arms 2½ feet long, weigh maybe 20 pounds. On our North Pacific coast, 50- or 60-pounders, with seven-foot arms, are fairly common. The biggest Norris ever caught was an 85-pounder with 9½-foot tentacles. In the South Pacific the arms stretch out to a length of 14 feet—but they get mighty thin and stringy. Even there, a 200-pound cephalopod would be a giant. Many octopuses are tiny: The tentacles of some adults never exceed an inch in length.

Hugo had his beast try to gouge out a man's eyes with its tough beak. Every octopus has a beak but, Kenneth Norris

Retiring and shy, they are extremely clever at hiding . . . And sometimes they get seasick, even as you and I.

reports, the large ones don't bite humans. "I've handled quite a lot, especially the big ones, for the last eight years," he says. "They've never bitten me."

It's the tiny ones that bite. "A little bitty one in the Gulf of California," says Norris. "Inch-and-a-half arms. He's the one that fights. He bites. He has an anticoagulant in his saliva. You keep bleeding. It hurts like the deuce."

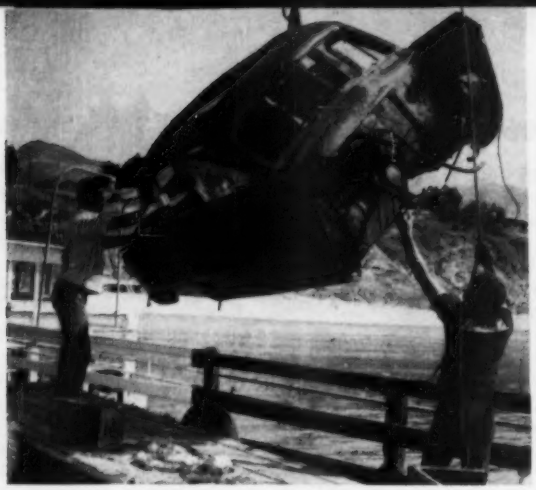
Hugo said the octopus could crush a man, like a boa constrictor, and also choke him. In spite of the pressure you feel when the arms enwrap you, this is more balderdash. The octopus neither squashes nor throttles.

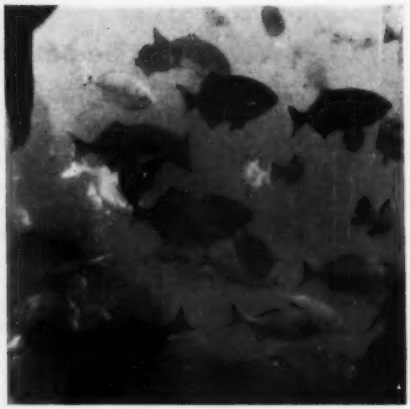
The only wounds on record, from any octopus, besides the bites of small ones, are occasional red marks, with the skin rarely broken, where the suckers have gripped.

Teuthologists agree with Hugo on one detail: The grip of the suckers is strong. Hugo guessed an octopus had 500; actually, most have 240 on an arm, or 1,920 altogether. The suction cups are better than those on your windshield because they can curve around and adhere to a round surface like your arm. They are, says a U. S. naturalist, one of the most efficient systems among animals for capturing prey, better by far than claws or teeth, and inferior only to the hand of man with its opposable thumb.

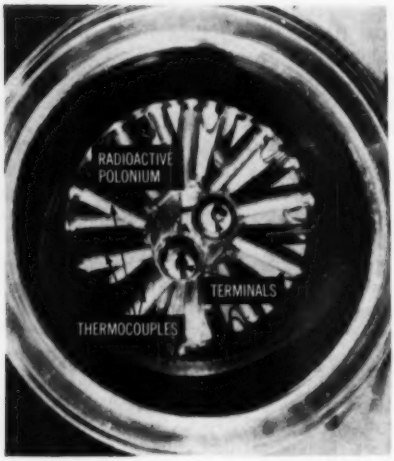
But the grip is not unbreakable. Caught by a South Pacific big one, a diving U. S. scientist bent his legs, thrust up from the bottom, and by himself jerked the octopus loose from its anchorage, and brought it up with him. Murray A. Newman, curator of the Vancouver Public Aquarium, says that his skin divers work this way as routine. They go out and try to persuade octopuses to wrap

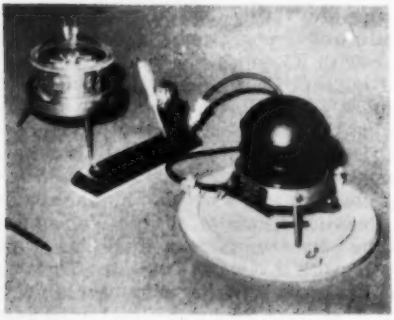
[*Continued on page 224*]



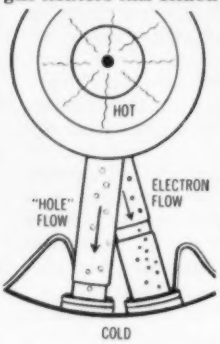


GOOD FOR FISHIN'. Junked car bodies—20 of them at $10 apiece—were dumped by sportsmen to form a man-made reef on barren ocean floor off Paradise Cove, Cal. Result: An area that once afforded no food now teems with fish. At left a body is stowed on a barge for towing to site.





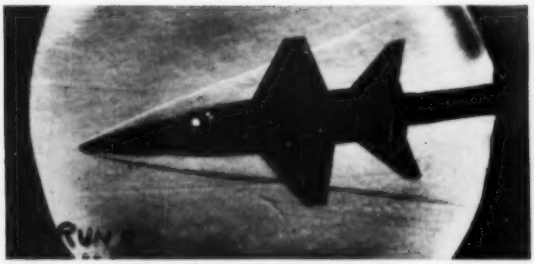
ATOMIC POWER—DIRECT. What started out as an improvement in controls for gas heaters has ended up as an atomic casserole (bottom photo) that cooks up electricity for space satellites. The five-pound unit generates five watts (enough to light three flashlight bulbs) for five months—yet contains no battery or dynamo. It converts heat from splitting atoms directly into electricity.



The space power package contains a 1/50-ounce pill of polonium. Its disintegrating atoms create heat (720 degrees F.). Around the polonium pill are 10 thermocouples of lead telluride. Heat pushes away electrons in one leg (n-type) of each thermocouple. In the other leg (p-type), heat pushes away "holes" – spaces for electrons – and sucks in electrons from the cold end. So electricity flows up one leg, down the other.

Martin Co. designed the heat pill, while 3-M (Scotch Tape) worked up the generator from a development started by a Milwaukee heater-control firm, Baso, Inc. Baso already uses similar units in self-powered thermostats for room heaters (they get their heat from a gas flame, not atomic pills).

GHOST RIDER. This eerie instrumented dummy astride a 1,200-m.p.h. rocket sled tests the effects of tremendous wind blasts on its protective suit for the Air Research and Development Command at Alamogordo, N. M. The 165-pound dummy weathered a 35,000-foot run in good condition.



FIVE TIMES SOUND. Model of the X-15 in a Mach 5 speed test in Cornell Aeronautical Laboratory's shock tunnel. The North American rocket [PS, Jan.] is the first built to fly man into space.

RED SPECIAL. Latest from Russia is this seven-passenger Zil-111. It has power steering and windows, and power brakes cooled by fins acting as blowers in the hubcaps. It can hit 105.

LEAPFROG. Getting an assist from a Sikorsky S-56, a five-ton M-56 tank armed with a 106-mm. rifle surmounts an obstacle during training demonstrations at the Army infantry center at Fort Benning, Ga. Whirlybird lifts enables tanks to cross water, swamps and other difficult areas, cover ground quickly to drop them into position for engaging the enemy.

CLOSE-UP OF CANAVERAL:

Last Stop Before

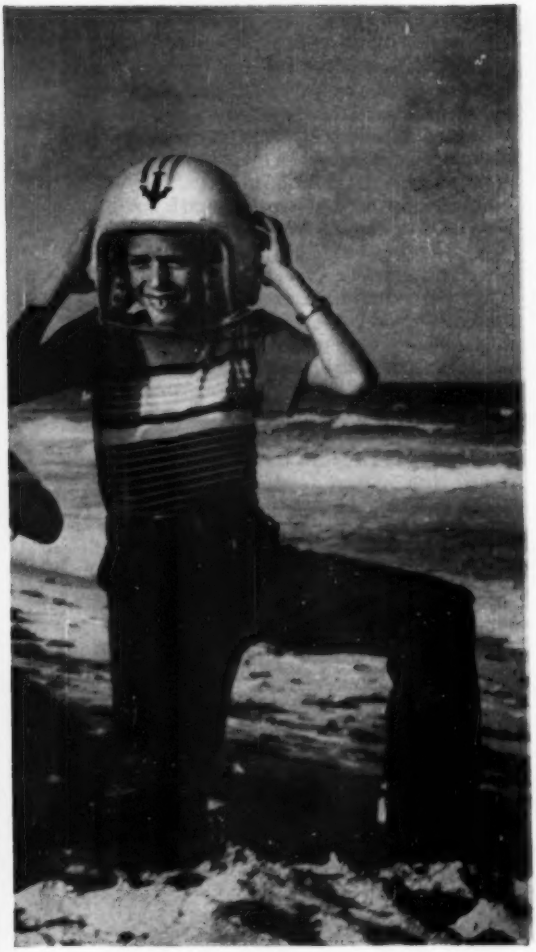
This is life at Cocoa Beach, our newest frontier town,

Youngsters who live within sight and sound of the launchings at Cape Canaveral stage

An evening performance by an Atlas is the biggest show in town. Its opening rumble brings everyone outdoors.

Space

next door to missile shoots



imitative "firings" with realistic toys.

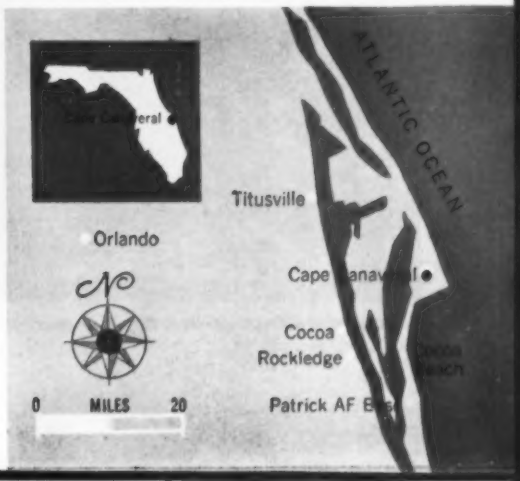
By Frank Harvey, with photos by W. W. Morris

THREE miles away across the palmetto scrub of Cape Canaveral, the Atlas ICBM, cinched to its launching pad, looked like a silver fountain pen in the blaze of floodlights. I adjusted the field glasses and the bird came to me, big and with exciting detail. Her flanks were snow-white from the frost caused by liquid oxygen. She was puffing white lox vapor through her top vent holes. Beside her, tall and candy-striped, was the tower that carried the electrical umbilical cord.

Over the bullhorns a matter-of-fact voice said, loud and clear: "T minus two minutes and counting."

The skin prickled on my neck and I looked south to the lights of Cocoa Beach, the nearest town, glittering on the horizon 15 miles away. Fifteen miles was nothing to an ICBM. Not long ago a Po-

The double map below shows where Cape Canaveral lies in respect to near towns and to the rest of Florida.



Growing pains hurt, but there's no crime in exciting, missile-happy "whoom" town

laris IRBM had gone crazy on launch and a hefty chunk had exploded in the Banana River a short distance from a Cocoa Beach tourist court. But Polaris was a baby compared to Atlas. If that frost-encrusted monster on the pad got loose and smashed its 100-ton burden of lox and RP-1 fuel into Cocoa Beach, there might not be enough left to write the story I'd come for: a close-up look at this first American missile town.

But disaster was unlikely. Lt. Col. Ray Stephens, sitting at his Destruct Button in Central Control, could blow a wandering Atlas to flaming bits in a single heartbeat.

The bullhorns rumbled, "T minus 90 seconds and counting." I hairline-focused the glasses on the complex. Magnified by the lenses, it looked like a Technicolor movie set: the white monster under the lights . . . the now loosely dangling umbilical . . . the brightly flashing red warning light . . . the huge gantry tower, partly in shadow . . . and behind it all the vast Atlantic and a velvet sky with stars as thick as spilled gold dust.

"You guys lucked it," said Dick Roper, who works for United Press. "Some people wait for weeks. You and Bill Morris show up in the afternoon, and they shoot an Atlas the same evening."

"We came to do the town," I said, "but a shoot's a fine start. After all, if it weren't for these birds, Cocoa Beach would just be a wide place in the road between Daytona and Miami."

"I beg your pardon," said Roper, a man with local pride. "Cocoa Beach was —and is—the sea-trout capital of the world. And since you've mentioned Daytona—50 miles above here—our beach is just as good as theirs, only not quite so long."

"Thirty seconds and counting," the bullhorns informed us.

"Not to mention our oranges," said Roper. "Indian River fruit—"

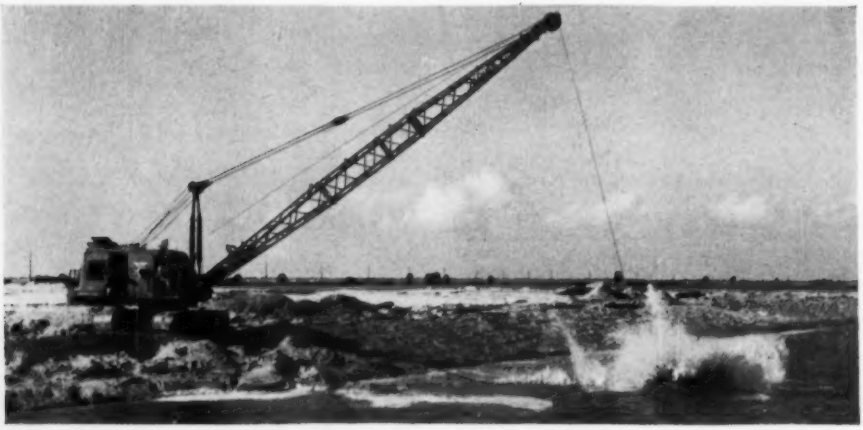
"For Pete's sake," a photographer yelled in the dark, "will you guys stop yacking and hold still! This platform wiggles if anybody breathes on it . . . and I'm shooting slow!"

Everybody sort of froze, and I could feel the soft breeze from the south.

"Ten," the bullhorns intoned. "Nine . . . eight . . . seven . . . six . . . five . . ."

At the count of three the vernier engines lit—two orange blowtorches snapping on suddenly on the big bird's flanks. The count went down to zero.

A rich stream of orange fire, looking like molten steel, flowed out of the flame bucket and was instantly smothered in boiling clouds of steam. Then, still in utter silence, the monster rose torpidly from



A drag line scoops up new land for more houses from the bottom of the Banana River.

Cocoa Beach's city hall is a one-story shack, with a brand-new sidewalk in front.

its pad and hung in the air, *drifting sideways* in the breeze. The rich orange of the deflected fire was gone now. The three engines of the Atlas made an intolerable sun-glare. The cape was lit with an evil, acid brightness that made you think of the destruction of cities. Fourteen seconds after the first sign of fire, the sound arrived at the press tower—a guttural, phlegmy roar, like an enraged giant with a bad cold.

The Atlas rose slowly, balanced on its sun-bright tail, "programed" over gracefully and headed out. Soon it was a small, vicious torch against the stars. The torch winked once, as the boosters fell free.

Finally, about 200 miles away, 100 miles high, and moving 15,000 miles an hour, the firefly speck burned out.

"Starlite Bar, here we come!" somebody yelled. "We got us a green bird tonight!"

Twenty minutes later, official word came through. This particular Atlas had worked perfectly and was now far downrange. It was up there in the poison wilderness of Van Allen radiation, 1,000 miles high, and falling with inexorable accuracy toward its impact point.

The Starlite Bar, unofficial press headquarters in Cocoa Beach, was roaring happily when I arrived with B. G. MacNabb, field manager for Convair and the man in charge of the Atlas just fired. We took seats under the hurtling moons and meteors that decorate the walls of this bistro, and pretty girls in thigh-gripping leotards and space tunics served us Atlas Specials—a multi-propellant drink with a small blue flame hovering on the surface.

"Pretty active party," I said.

"Dead," MacNabb said. "You should have been here in the early days after a good shoot. One time they threw about a hundred chairs in the swimming pool. Matter of fact, they got to throwing people in later—fully clothed."

"Nobody got sore?"

"Look," MacNabb said. "You go

Just in case a tourist doesn't realize where he is, this busy road sign near town ought to tip him off.

through a month of get-ready. You go through a three-day count. Then you put one in the little barrel 6,300 miles away. Man—it's a privilege to get thrown in some pool. After a good one you don't just sit down and blow on your fingernails. And that goes for about 90 percent of the people in this crazy town. They're missile-happy."

After World War II: acres of rattlers. I discovered, after a week of looking into every nook and cranny of Cocoa Beach, that MacNabb was accurately describing this fabulous place. But when a Navy air base was deactivated after World War II, Cocoa Beach, about 190 miles north of Miami, was about as dead as a harpooned flounder. Vacationists whizzed by on Route 1, and about the biggest transactions were consummated between trout fishermen and bait salesmen. Shrimp were going for a penny apiece, when there were any takers. Taxes were so low that the county authorities didn't bother to collect them until they were over that way on other business. And Cape Canaveral itself—the name, pronounced Ca-*nav*-er-al, means "cane plantation" in Spanish, the language of its early christeners—was probably the raunchiest-looking bit of real estate on the east coast of Florida: an ocean-pointed wedge of 15,000 acres of sand, palmettos, rattlesnakes, and nothing.

These times, a charming and mild-mannered man named Gus Edwards told me, were just about the low point in his personal real-estate career. Gus had had a crazy dream: If you bought a big spread of beachfront and held it long enough, you'd make a million dollars. In 1917, Gus had bought 2½ miles of beach property where Cocoa Beach now stands, for $1.50 an acre. He had paid taxes on it ever since. At one time he had even gone north and worked for years in Yankeeland—to keep those taxes up.

"Sell out, Gus," they told him. "The stuff's gone to $3 an acre. You'll double your investment, man!"

"Double," Gus Edwards said. "I'm not interested in double. I'm holding out for money."

They laughed at poor old Gus—until

At Vandenberg, 3,000 miles west of Cape Canaveral, a

THIS LAUNCHING PAD at Vandenberg AF Base is where the first Thor was fired over the new Pacific Missile Range. The dark object at center is the missile mount. The white shed at rear rolls forward to cover the missile, which hadn't arrived for the shoot when this picture was taken.

On a bulge of California's coast, 168 miles northwest of Los Angeles, lies 64,000-acre Vandenberg Air Force Base. But two years old, it is the only missile training center in the U.S. Already it swarms with 4,000 airmen, and before this year is over, it will swell to 8,000.

Vandenberg has a three-fold mission of the utmost urgency. It must turn out skilled crews to man ICBM bases in this country, crews for IRBM bases abroad—and it must turn itself into a combat-ready ICBM base.

Down among the dunes that skirt the

the missile base arrived. They are not laughing at him today. He watched his 13,200 feet of choice ocean-to-river property rise to $300 a front foot. And he held. It went to $500 a front foot, and he sold. He is not saying just what he sold and for how much, but if you multiply 13,200 feet by $500 a foot, you arrive at $6,600,000. And maybe Gus was a sucker at that. The stuff has moved to $700 a foot—and smart Miami money is betting it'll go to $1,000.

Whoom and bust? "Some old-timers are still worried," Gus Edwards says. "They remember the first Florida boom that burst like a soap bubble. They recall how it was after the Navy left the air base. They figure it may happen again: All these missiles may pick up and leave." Gus shifts his unlit cigar and grins. "I tell them it can't happen. Sure, there's another firing range out in California—but from what I hear, it's not going to take any missile business away from us."

Informed opinion backs up Edwards. Cape Canaveral, the headline-making

Having owned, and sold for millions, most of Cocoa Beach, Gus Edwards (right) is now "making" new land to sell.

part of the Air Force Missile Test Center, which also includes Patrick AF Base and a 5,000-mile test range, would be hard to duplicate. It's a semi-island, easy to isolate and guard compared to a mainland site. The climate is fine for missile

[*Continued on page 244*]

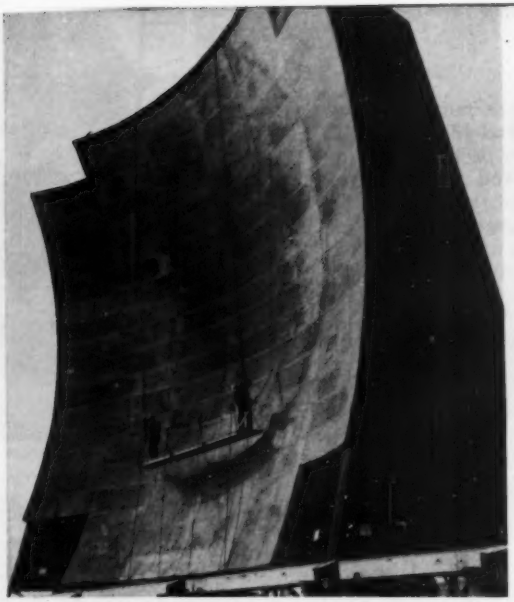
far bigger and hotter missile base is fast taking shape

chilly, fog-breeding Pacific, eight launching pads for 1,725-mile Thor missiles have already been built. Ninety degrees to the north of them, and about three miles away, stand a gaunt trio of widely dispersed, 130-ft. servicing towers for 6,300-mile Atlas missiles. More are building.

Precisely dotted across the adjacent plain are white-domed radar stations, for tracking missiles in the first few miles of their long trajectories through space.

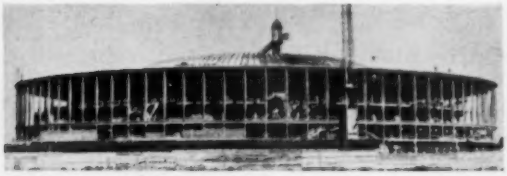
Vandenberg has one great physical advantage. Unlike Canaveral, it has access to vast areas of empty ocean in several directions. From it, ICBMs can be fired full-range. Directly south, the nearest land—the tiny Pitcairn Islands—is more than 4,000 miles away. That makes it the only U.S. base from which satellites can be launched into a polar orbit, vital for scanning the earth's settled regions, without risk of dropping a booster rocket on a city.

A THOR STARTS RISING to firing position, still fastened to the trailer that trucked it to the launching site. The trailer remains attached until the missile is vertical.



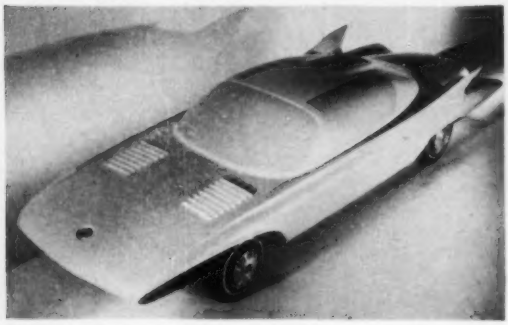
EAR DOCTORS. Telephone-service men here calk the seams of a 60-foot parabolic antenna in the White Alice all-weather communication system in Alaska. Once each year they do this maintenance chore on each "ear" in the 3,100-mile line.

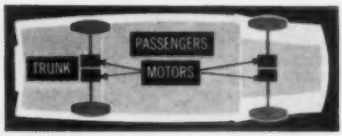
DAMPER. This truck-mounted SeaMaster jet suppressor converts noise to less-audible high-frequency waves. The steam is from water cooling afterburners.



OLYMPIC PALACE. The mammoth stadium above goes up in Rome for the Olympic Games next year. More than 100 feet high, the spectacular building will be topped with a dome over 300 feet in diameter. Cost is $3,200,000.

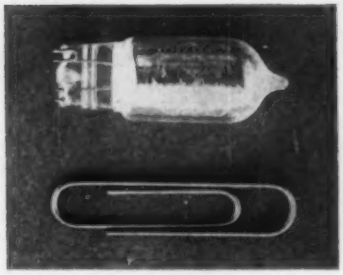
PUSHBUTTON PHONE. With this new telephone you can dial an ordinary call or push buttons to talk over 12 or more inter-office phones at the same time.





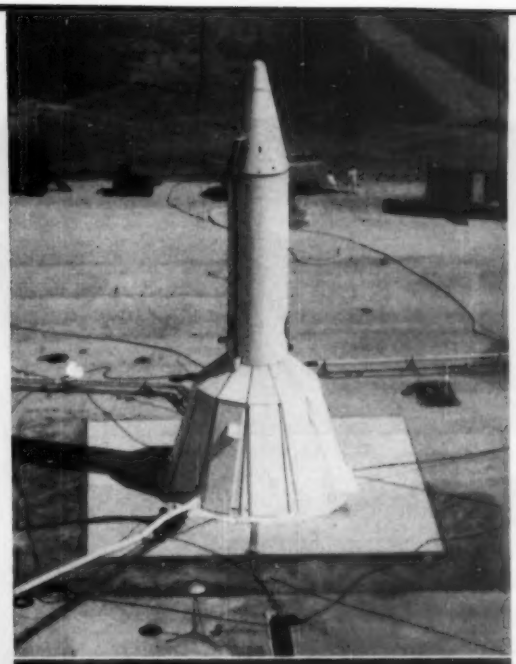
IDEA CAR. An electric motor getting energy from hydrogen and oxygen gas would drive each wheel of this De Soto Cella I, eliminating transmission, differential and drive shaft. The dream car is shown in scale model at left.

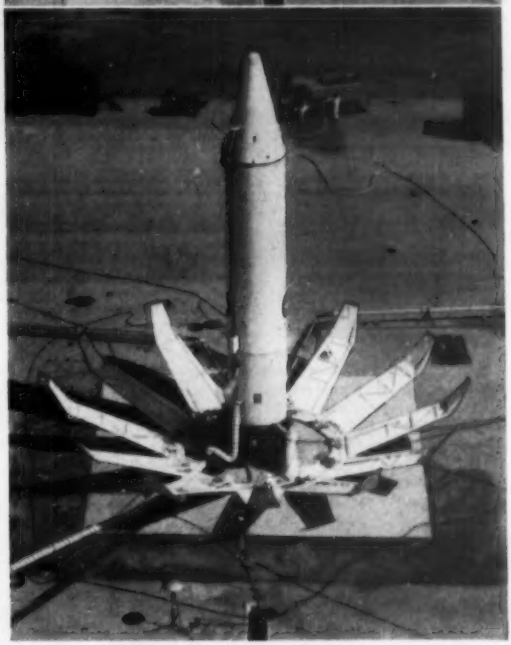
FIBERGLASS BIKE. As modernistic in looks as a moon rocket, this machine still works on pedal power. It's a British super-streamlined bicycle wearing a new coat made of fiberglass.



TINIEST FLASH. A 1½-inch all-glass flashbulb, shown above full size with a paper clip, is made by GE. A fourth the size of the M2, it gives the same light, fits a two-inch reflector.

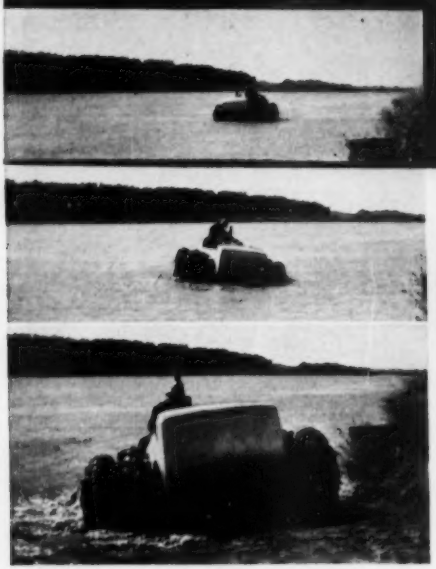
MOBILE FURNACE. This old locomotive's boiler provides emergency heat for a new German apartment house (background). It will serve until the heating plant is connected.

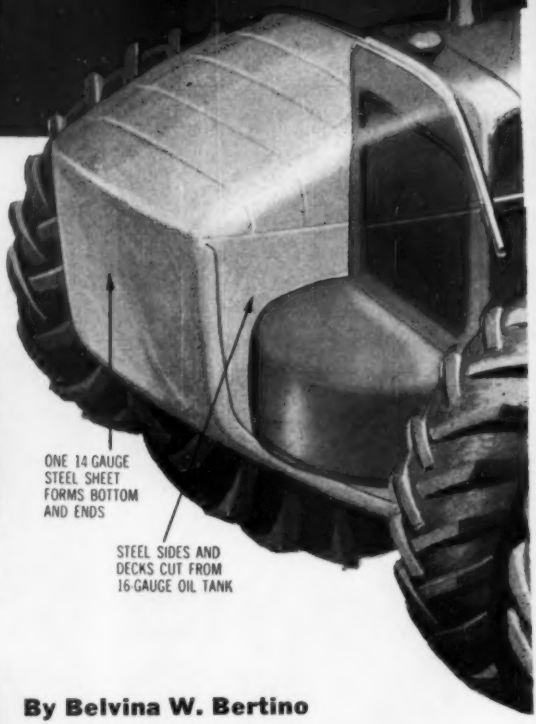




JUPITER "ROSE PETAL." The device around the base of the Jupiter here folds up (top photo) to permit work on the intermediate-range ballistic missile on rainy days, and opens (below) when the weather is good. It was developed by the Army Ordnance Missile Command at Redstone.

Homemade DUCK





THE DUCK FLOATS AT HUB DEPTH, carrying a 1,000-lb. load. Her water speed is about two m.p.h.; top land speed is 15 m.p.h. Dual tires ride over the softest ground. The amphibian's builder, Bill Fisher, stands at right, below.

By Belvina W. Bertino

NOTHING stays Bill Fisher from his rounds since he enclosed a tractor in a homemade steel bathtub. The eight-wheeled amphibian crawls over the roughest terrain and uses a propeller and wheel-hub paddles to churn through water.

Mailman Fisher got tired of criss-crossing the half-mile-wide Missouri River four times on every 100-mile trip between Brockton and Enid, Montana. He needed

Carries the Mail

FOUR-WHEEL DRIVE tractor, bought secondhand, was changed very little.

a car on each side and one or two rowboats. Lugging mail sacks from one conveyance to another was hard work, even in good weather.

Now Fisher loads the mail into his tractor-boat, drives to the river at 15 m.p.h. and plunges across. He still uses a car for the long road stretches.

The used Power Horse 40 tractor plus sheet metal and parts cost about $1,300.

Now you can buy

House Paint That

By Henry B. Comstock

SHOPPING for house paint this year? Then prepare to hear persuasive new sales pitches for a product that is still the most challenging in a billion-dollar industry—water-thinned exterior acrylics. They've been pushed for over four years. But now, for the first time, endorsements are coming from several big-time manufacturers.

Listen to what Du Pont has to say about its line:

"Fifty-percent longer life than the finest oil-based finishes, when applied to properly prepared surfaces. Unmatched resistance to fading, yellowing, cracking, blistering and peeling."

And this from the 110-year-old John Lucas and Co.:

"All the proven advantages of inside water paints—plus new exterior beauty, protection and permanence."

These are not careless hucksterings. They're backed by years of exhaustive lab work, and thousands of field tests ranging from Florida to Vancouver.

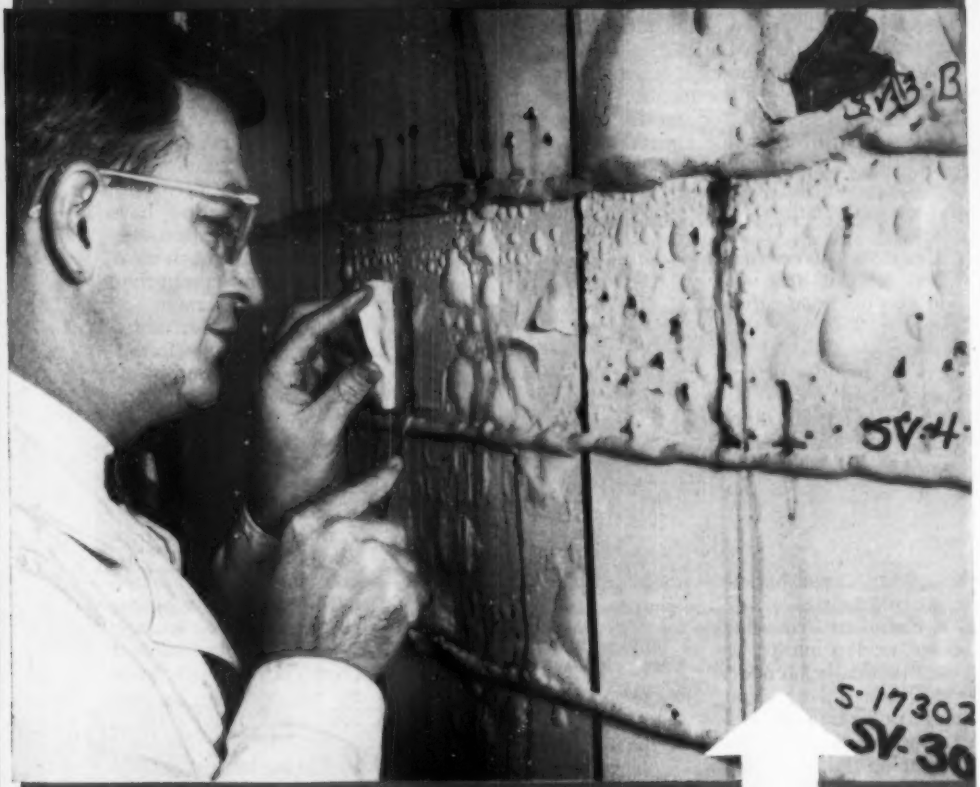
But before you rush out and buy a bucketful of either—or of any other acrylic house paint now on the market or soon to be offered—there are equally important things you should know. They start with an understanding of what paint is and where the name "acrylic" fits in. Whether it's thinned with water or a solvent like turps, all paint contains two basic ingredients:

Pigment. That's particles of opaque material that give the stuff its color and ability to hide what's underneath. It also helps to keep sunlight from breaking down the final paint film. There's little difference between the pigments used in water- and solvent-thinned products.

Vehicle. That's the liquid part, which also has two ingredients:

PIGMENT + VEHICLE = PAINT. Binder + thinner = vehicle. When the binder is acrylic, the house paint is, too.

Lasts 50% Longer



SHARP CONTRASTS in temperature and humidity on the two sides of panels in Du Pont's "blister room" make samples of conventional paints break down fast. Arrow points to Du Pont's new acrylic.

• Thinner. Without it, you couldn't brush, roll or spray paint on. During the drying process it evaporates.

• Binder. Either a liquid, or microscopic bits of some semi-solid, used to stick the pigment together and bond it to the surface of the work. This is paint's very important film-forming ingredient.

Acrylic is the binder in any paint that bears the name. A synthetic resin closely related to Lucite and Plexiglas, it doesn't dissolve in water, but is dispersed in it, forming a milky emulsion. Manufacturers thus may choose any one of three

accurate phrases to identify their water acrylics: "water-thinned acrylic resin," "acrylic emulsion," or "acrylic latex."

Whatever they call them, do *not* confuse this type with the new acrylic lacquer now being used on all General Motors cars. If any paint dealer tries to impress you with the "What's good for GM—" pitch, shrug it off. The amazingly tough and beautiful "Magic Mirror" auto finish is not water-thinned; it has a strong solvent that dissolves the plastic. Using it as an endorsement for acrylic house paint is misleading; while both have fine durability, car lacquer is one thing, exterior wood and masonry paints another.

Easy application. When interior and outside acrylics made their bows in 1953 and 1955, respectively, their futures looked equally bright. They had all of the qualities that had made other latex-type paints big sellers then, as they are today.

Here's a quick rundown:

- Fast application. You flowed them on; no tiring roller drag.
- Excellent covering power; no lap marks.
- Practically no odor.
- Quick drying. You could put on a second coat in two hours; no need to move ladders or scaffolds twice.
- Surfaces didn't have to be dry; outside, it was safe to paint right after a shower.
- Easy clean-up with soap and water.
- No flammable solvent.

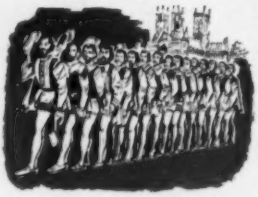
In another department, acrylic had it all over rubber latex, and an edge on polyvinyl acetate. Its film was more rugged. It looked like a natural for house painting.

The Achilles' "peel." But it hasn't worked out that way. Of the seven million gallons of water acrylic sold by more than 550 American outfits last year, only one fourth was used outdoors.

Blame part of that on one shortcoming of all emulsion type, film-forming binders, including acrylic. When exposed to the weather, they do a very poor job of bonding themselves to raw wood, and to previously painted surfaces that are slick, chalky or dirty.

Manufacturers who jumped on the water wagon too soon, plugging untested acrylics as all-surface finishers, undoubtedly set the product back. For a customer never forgets or forgives a bad house paint, and when these "wonder plastics" were spread over anything and everything, they proved about as stable as bubble gum. They cracked and popped and shriveled and peeled.

Where'd it come from?



ROD: No, that's not a medieval chorus line above, but 16 men with left feet forward measuring out a legal rod. Time: Sunday morning after church in 16th-century England. Today the rod's officially 5½ yards. Bet you didn't know: 40 rods = one furlong; eight furlongs = 5,280 feet—a statute mile.

Frustrating formulas. Exterior acrylics have moved slowly, too, because there's much more to perfecting a paint than whipping a couple of basic ingredients together. A single formulation may contain as many as 20 or more components, each tossed into the grinding mills for some particular purpose. One may produce low sheen, another reduce pigment settling; a third may provide the slow chalking that, combined with rain, keeps house-paint surfaces looking fresh. In water-thinned products, there may even be an additive to prevent mold growth.

As important as choosing or developing the right ingredients, lab men must determine just how much of each to use.

All this takes time. On outdoor exposure racks, a paint sample that looks whitest for the first six months may show the greatest yellowing after two years. And what do you do about the one that chalks too fast in Florida, and too slowly in Arizona.

Neither John Lucas nor Du Pont would be offering acrylics today if they weren't convinced they've made important breakthroughs with their formulations.

How about adhesion? Here, there's a parting of the ways.

Lucas says that its new "Luco-Tex" product is suitable for *all* exterior surfaces

[Continued on page 226]

"I'd like to see them make..."

CURBSIDE TRASH RECEIVERS like the mail boxes that can be reached from inside a car. On highways they could be at the edge of the shoulder. —*John Bryant, Cumberland, Md.*

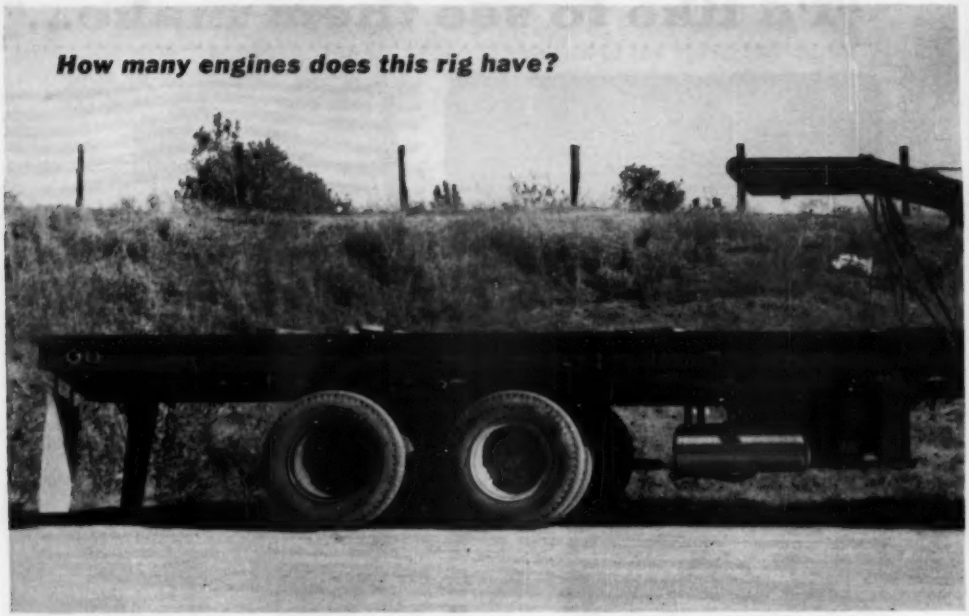
VENETIAN BLINDS OF FLEXIBLE PLASTIC. Youngsters (or the family pup) couldn't bend them out of shape when they poke them aside to look out windows.—*Glenn Corbett, Kansas City, Mo.*

TRANSPARENT-PLASTIC GAS TANKS on lawn mowers, so you could check fuel level instead of waiting until the mower stops to know that the tank is empty.—*Jeffrey Konig, Grafton, Wis.*

AN EASY-TO-ADJUST HAND BRAKE for automobiles. Why not a threaded shaft so that by simply turning the handle clockwise, you could tighten the brake?—*H. J. Simoff, Cleveland.*

AN ANTENNA CONNECTION on small transistor radios so they could be operated more efficiently in a car, using the regular automobile antenna.—*Charles E. Yeatts, Camp Hill, Pa.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE readers. What's *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

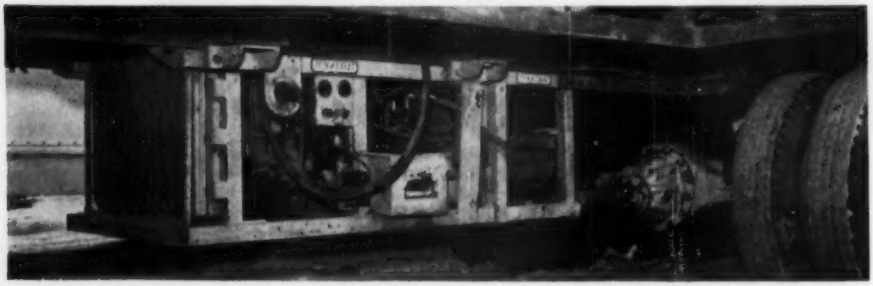


How many engines? Four: one under trailer, one in "jeep" trailer (on top), two under cab.

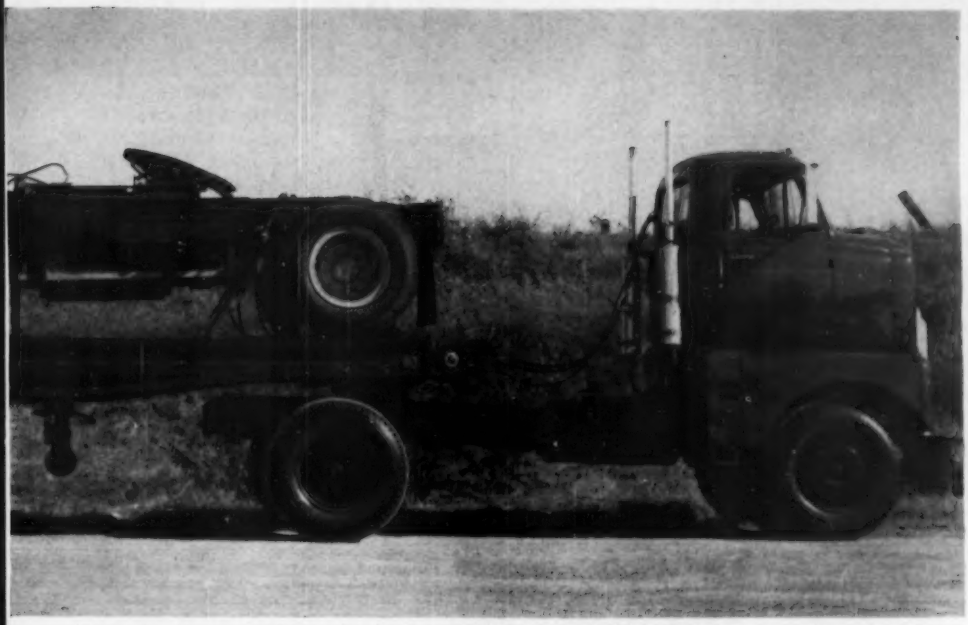
Extra Engines Beef Up

MOTORISTS need have no fears about a "Big Wolfer" ahead slowing them down on an uphill climb. "Big Wolfer" is truckers' lingo for a fast new tractor-trailer rig with a Dynassist Wolf Pack—a 130-to-150 hp. International engine—bolted beneath a semi-trailer and coupled to its wheels. By flicking a valve on the steering column, a driver can throttle both tractor and trailer engines with one pedal. The extra punch converts medium-capacity rigs to superhaulers that level hills without shifting, dig out of traffic, and plow through mud and snow that would bog down ordinary rigs.

Dallas engineer Lloyd Wolf, who designed Dynassist, also offers Twinassist—dual tractor engines—and a "jeep" trailer that couples between semi and tractor to provide still more power.—*John Rogers.*

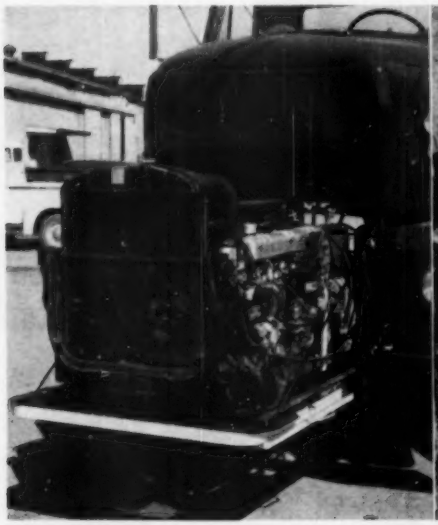


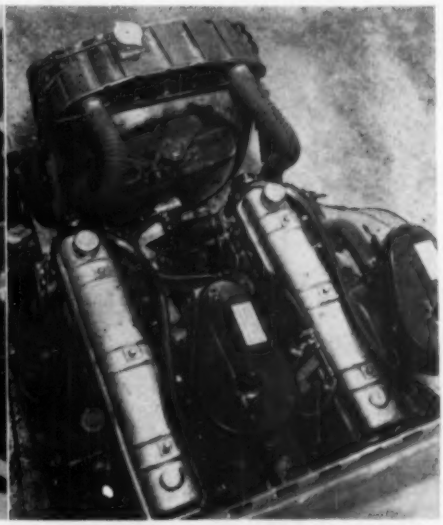
Trailer engine gives extra push on hills to help tractor. It has an automatic transmission.



For extra power on heavy hauls, jeep trailer is coupled between tractor and semitrailer.

Heavy Highway Haulers





TWIN ENGINES ROLL OUT for repair. The two engines weigh less and cost less than one of equal horsepower, says Wolf. At cruising speed, one engine idles—saving fuel—while the other pulls the load. As acceleration increases, the idling engine revs up to help its mate.

World's Biggest Bug Shown Actual Size

GOLIATHUS GOLIATHUS is his full name and he is four inches long—eight inches wide when he spreads his wings for flight. He was brought to New York by a traveler who gave him to the American Museum of Natural History where he seems to thrive on bananas. Golly, shown here in his natural colors, began life as an egg in a rotten log in French Equatorial Africa. As a six-inch grub, he somehow escaped being fried in palm oil and eaten by natives, the fate of many Golly grubs.

Now the Chinese Are Making Cars

THE Chinese Communist colossus is striving mightily to put itself on wheels—in the past year its infant automobile industry has produced nearly 200 different prototypes of cars, trucks and tractors.

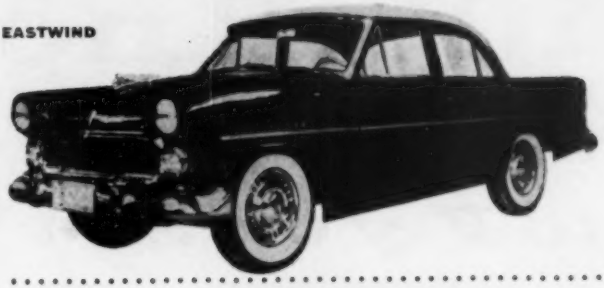
Despite strong Russian influence in the smacking-new factories, the latest Chinese models shown in the photos at right suggest a mixture of Western styling ideas.

The Eastwind, at top, powered by a 70-hp. overhead-valve engine, bears a flattering resemblance to a British Ford Consul. Yet an advertisement in an English-language magazine aimed at the export trade describes it as a "medium-class car combining quality with distinctively Chinese elegance."

More like a European General Motors product is the sleek-looking Peace four-door sedan just below it, while the smaller two-door Chingkanshan smacks of the little French Renault and the British Standard.

The dual headlights, plunging hood and split windshield of the 95-hp. Progress (last in line) point to mixed-up Americana, circa 1928 and later.

EASTWIND



PEACE

CHINGKANSHAN

PROGRESS

100-Knot Liner to Fly on Sea Wings

An ultra-fast new way to travel, in vessels that ride high above the waves, is promised by the conquest of the sea's speed limit

By Alden P. Armagnac

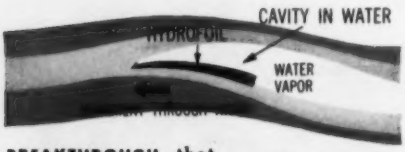
DRAWINGS BY BOB McCALL

YOU'LL skim to Europe at mile-a-minute speed or more, in liners that ride above the waves on stilt-like legs and underwater wings. Coastal liners, of similar submerged-wing or hydrofoil type, will whisk you to vacation climes at a fantastic 100 knots, or 115 land miles an hour. An American breakthrough in marine science makes it feasible to build such ships as these. The long-standing speed limit for seagoing vessels is shattered by a revolutionary new "supercavitating" shape for hydrofoils and water propellers.

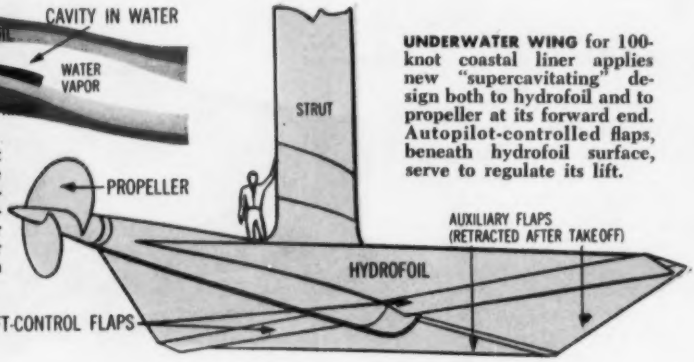
Whether this discovery can be exploited in ultra-fast passenger liners is answered with a "yes" by a six-month, $75,000 engineering study recently completed for the U.S. Maritime Administration by the Grumman Aircraft Engineering Corporation, Bethpage, N. Y. What some of the resulting ships will look like may be seen in the pictures that follow, based on actual drawings in the Grumman study's three-volume report.

Already under way is the next step to make these dreamboats come true. The Maritime Administration has just commissioned Grumman to design an 80-knot, 100-passenger hydrofoil ship as a prototype. Expected to be launched and cruising by late 1960, this experimental-scale vessel of 70 tons and 110-foot length will be powered by gas turbines totaling 10,000 hp. or more, which will propel the radical craft by driving water pro-

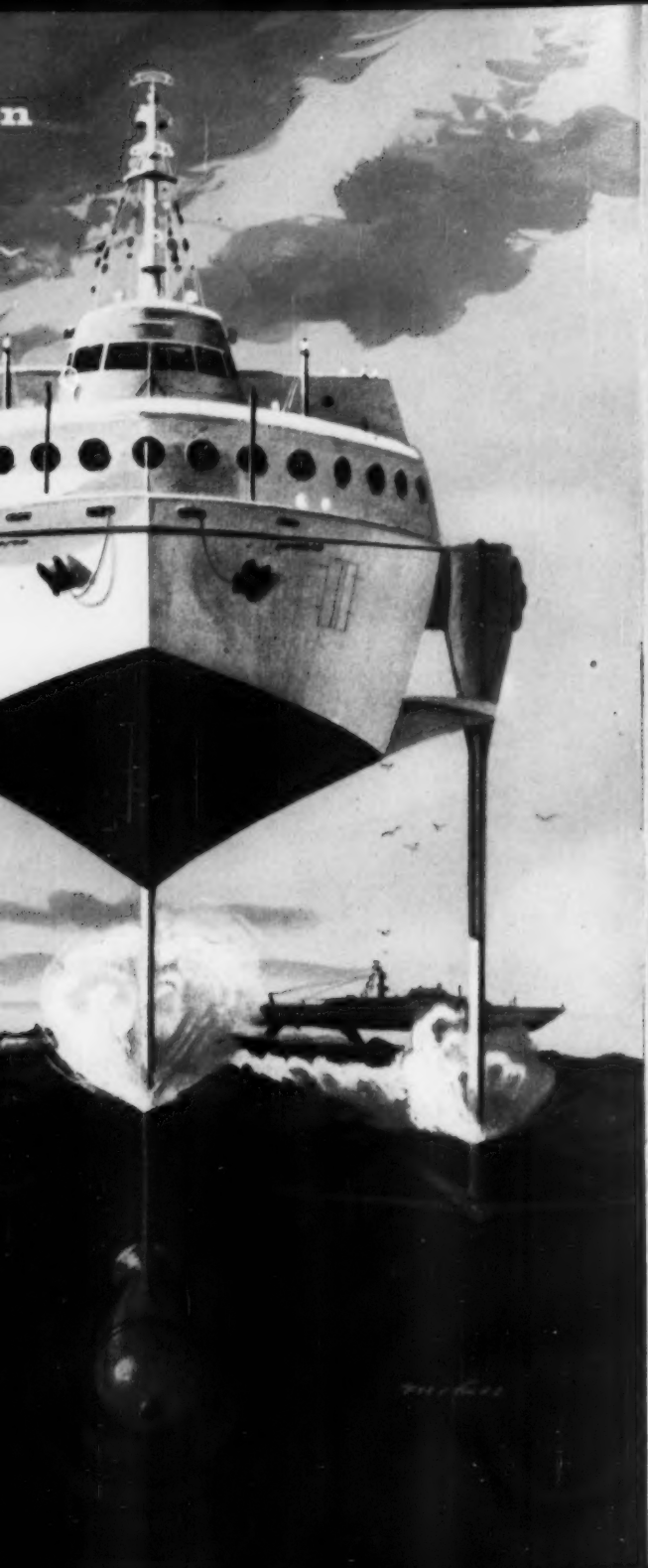
[*Continued on page 238*]



BREAKTHROUGH that conquers barrier to more speed for ships is discovery of the "supercavitating" profile, for hydrofoils and propeller blades, shown in action in diagram above.

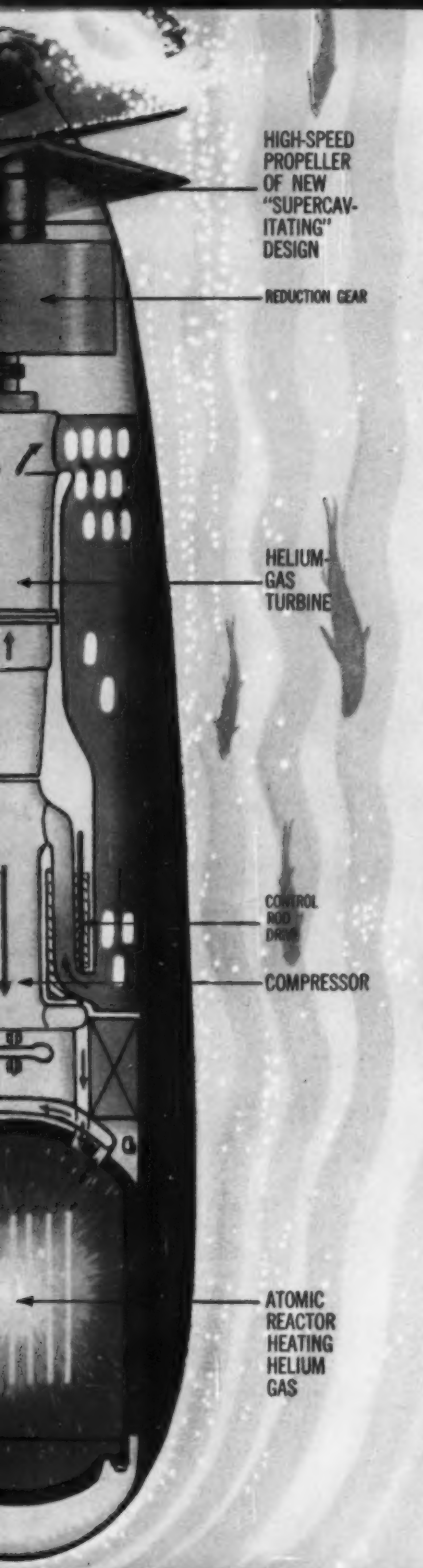


UNDERWATER WING for 100-knot coastal liner applies new "supercavitating" design both to hydrofoil and to propeller at its forward end. Autopilot-controlled flaps, beneath hydrofoil surface, serve to regulate its lift.

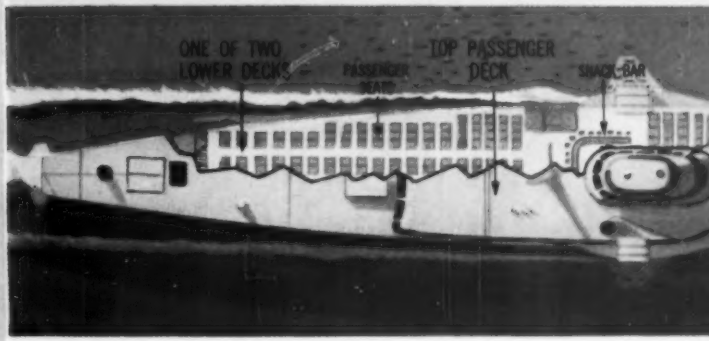


Atomic Engine for A-Liner

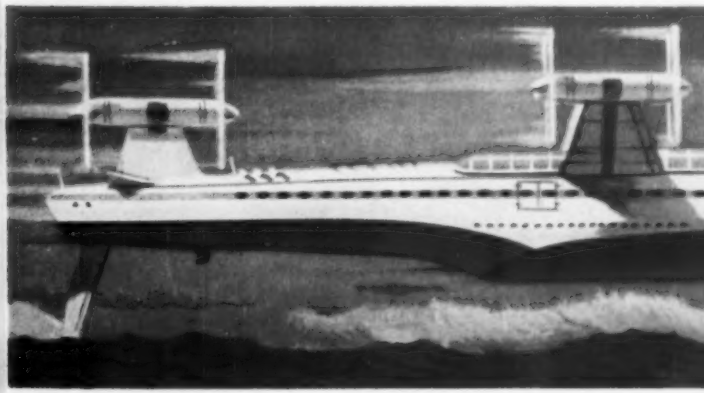
Submerged pod, pictured from above, holds atomic reactor, turbine, and gearing to drive single high-speed propeller.



100-Knot Coastal Liner Is Fastest



THREE GAS TURBINES spin water propellers to drive this 652-passenger, 500-ton craft at 115 m.p.h. Its speed requires all-enclosed quarters, for protection from wind. Passengers' airpla
er decks; top deck has a
Cutaway side and top vi



SIX AIR PROPELLERS powered by individual gas turbines drive seaplane-hulled coastal liner, in an alternate design. This craft would have same passenger capacity, tonnage and
Both are designed to
nautical miles, which

e Atomic Ship at Full Speed

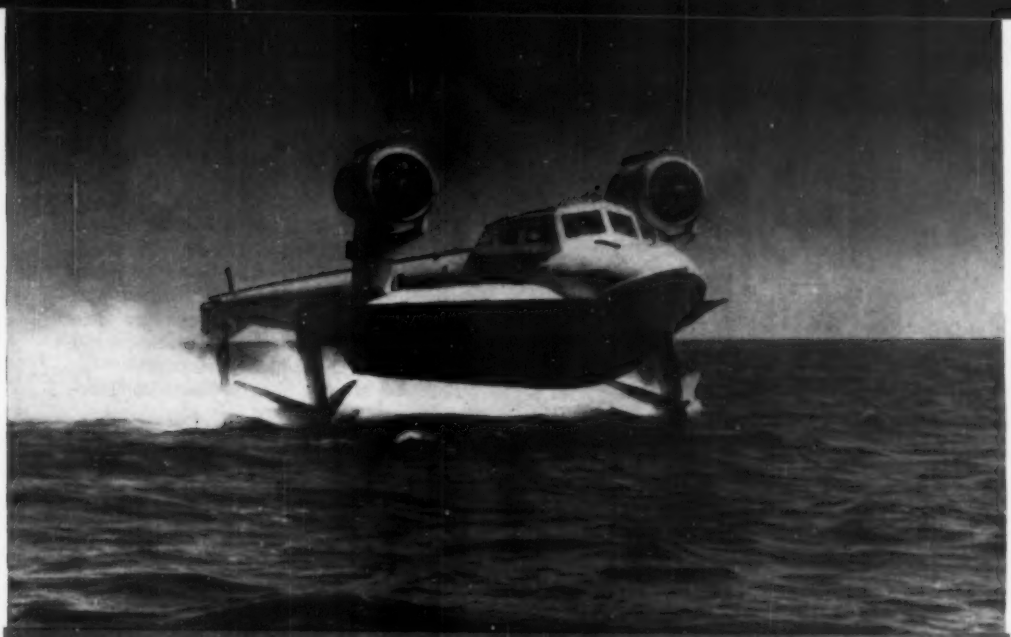
h foils retracted, hull submerged, using a non-atomic auxiliary engine.

In open water, foils go down. A-engine start

Yachtlike 320-passenger vessel of
by A-power, will race across Atla
queens. Unlimited in range, this
knots, or 75 m.p.h. Others of sh

starts, and hull rises from water as vessel gains speed.

At full speed, hull rides high above waves. Reversing these mar

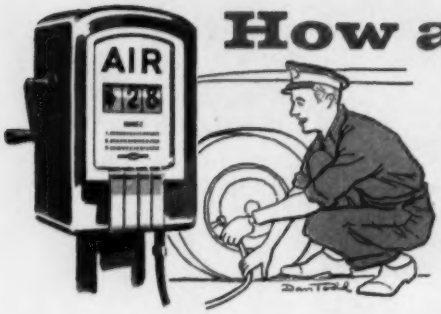


U. S. NAVY'S XCH-4 an experimental 53-foot air-propelled hydrofoil craft, has bettered 70 knots and is called world's fastest open-sea vehicle. Now the Navy is interested in hydrofoil-type landing craft, antisubmarine motor torpedo boats, and coastal patrol vessels.

Today's Hydrofoil Boats Preview Tomorrow's

HYDROFOIL SPEEDBOATS already on market range in size from this Grumman outboard runabout up to 32-foot cabin cruisers. Russian and Italian hydrofoil ferries, as large as 50 tons, carry up to 150 passengers. New hydrofoil design will multiply uses of fast water-skimming craft.

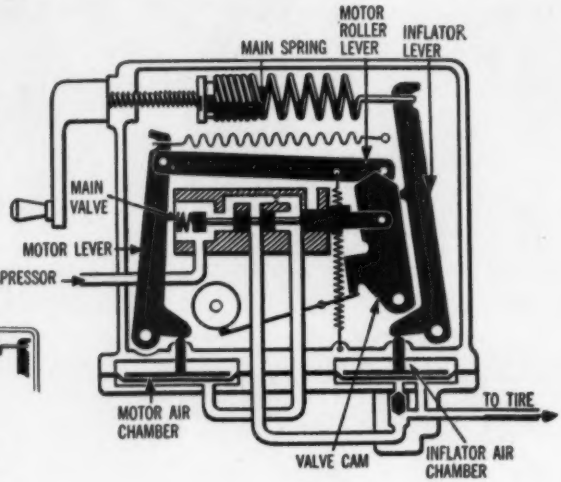
How an Air Meter

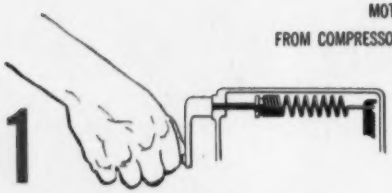


THAT familiar air meter at service stations has more inside it than just a bell. Actually, it is a clever interconnection of levers, springs, valves and diaphragms, designed to measure tire pressure and then feed air in one-pound "shots" up to the dialed pressure.

The one shown here is the Eco Tire-

INSIDE THE TIREFLATOR a valve controls compressed-air flow. It's moved by two levers that are pulled at the top by springs, pushed at the bottom by air-chamber diaphragms.



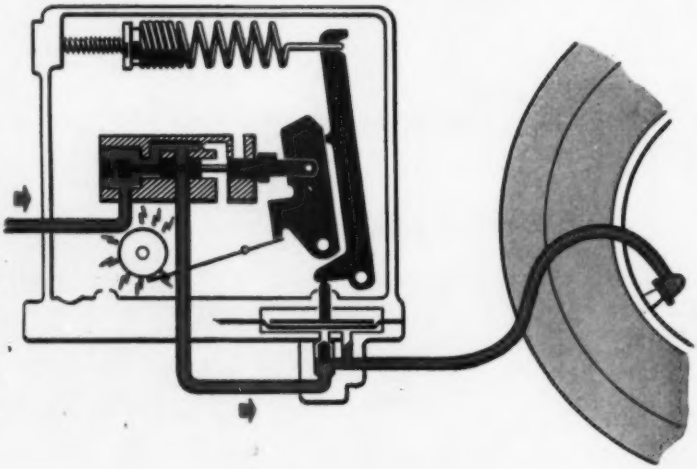


1

DIALING THE PRESSURE you want stretches a spring attached to an inflator lever. The spring is carefully designed to pull the lever with a force proportional to the pressure dialed.

2

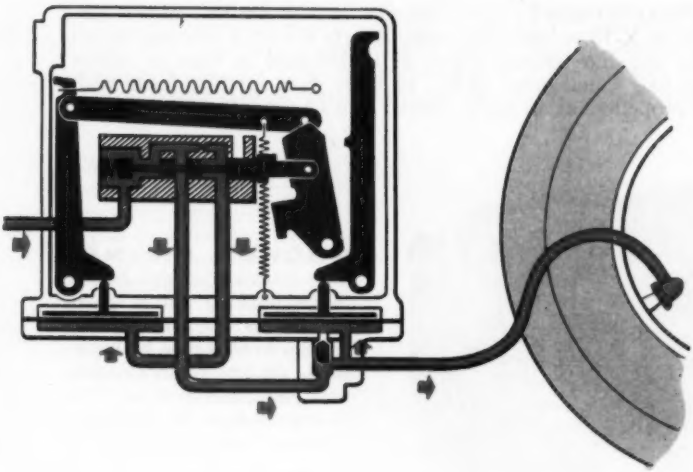
PRESSING THE CHUCK on a tire valve equalizes air pressure between the tire and the inflator chamber. If tire is low, dialed spring pressure overcomes tire air pressure against the inflator diaphragm. The inflator lever pivots "on," nudging a cam attached to the main valve. The cam snaps this valve open, hitting a bell striker as it does so. Now air flows into the tire.



Checks Your Tires

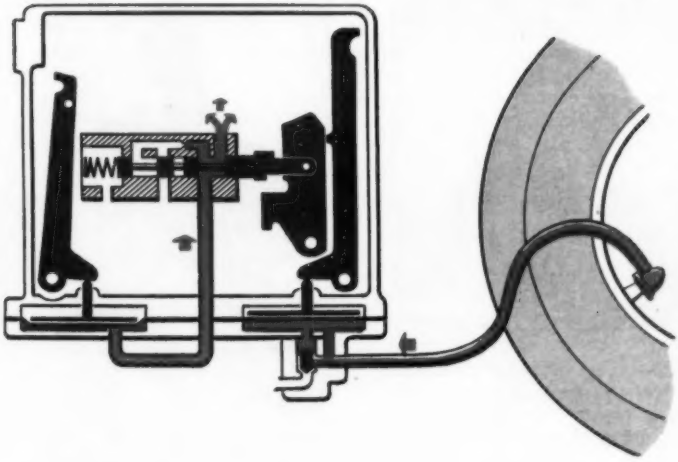
flator, biggest seller in the field. Virtually indestructible, many Tireflators are still pinging away after decades of use. Master gauge checks seldom reveal more than a 1½-lb. error in the older models. The newest model air meter is described here.

The makers of Tireflators have two tips for using their meters. First, they say, let some air out of your tire before applying the hose chuck. This blows out any dirt in the valve stem and corrects possible overinflation. The air meter will not bleed off excess pressure. Second, keep the fender between your head and the tire while inflating it. A poor tire may choose this time to blow.—*Erik Arctander,*



3

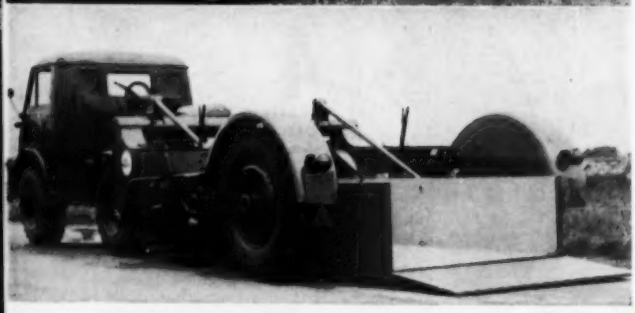
MAIN AIR FLOW goes to the tire, but two small streams are diverted inside the meter. One goes to the inflator air chamber and the other is piped to a second (motor) air chamber. Pressure quickly builds up in both chambers, forcing their respective diaphragms upward. When a pound of air has passed into the tire, the inflator lever and motor lever are both pushed to their "off" positions.



4

MAIN VALVE SNAPS OFF: No longer held open by inflator lever, valve is closed by its spring. A vent to motor air chamber opens as a result, releasing its pressure, and motor lever pivots "on." Inflator lever will also go on again, triggering another one-pound shot of air, if tire pressure is still lower than dialed pressure. If both pressures are equal, the air flow halts.

BIG TILT-WING TRANSPORT. This nation's largest vertical-takeoff airplane, Hiller's X-18 weighs 16½ tons, dwarfs the man standing at its nose in the sequence photos above. It is designed to take off either straight up like a helicopter (left), or from short landing fields with wings and propellers at an angle (center), or like a conventional plane



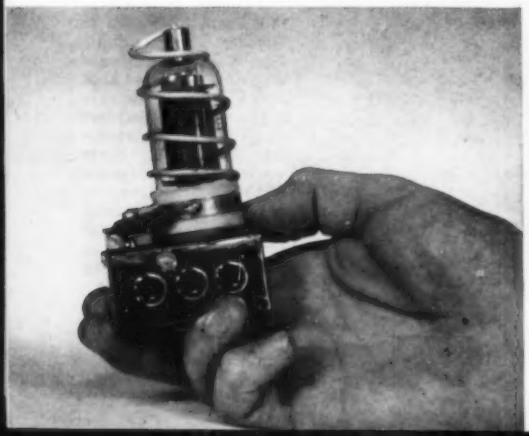
"PICKUP" TRUCKS. New German lift trucks (above) come with hydraulic arms that make loading and unloading fast and easy. The body at top can be raised as high as 10.5 feet for loading cargo planes or platforms; the other can be laid flat on the ground for rolling loads on or off.

ROCKET PHONE. The futuristic phone booth below, looking like a space missile, is used by a dry cleaner to advertise his business. At two main Cincinnati suburban arteries, it's in a good spot for both advertising and phoning.

when the runway is long enough (right). Strictly a test plane for the Air Force, its nose and tail sections are from a Chase transport. Two Allison T-40 turboprops and Curtiss-Wright dual propellers were borrowed from the Navy. A Westinghouse J-34 jet in the tail (with long tailpipe) helps control transition from vertical to horizontal flight.

BEACH FERRY. New Army shallow-draft cargo ship (right) is designed to shove its bow ramp into the stern or side opening of an ocean-going roll-on roll-off vessel [PS, Jan. '57], take off trucks and tractors and move them onto a beach. The 338-foot lighter will be operated by an Army crew.

MOON PICTURE. The tiny crystal-stabilized transmitter below is the core of a Navy-built eight-pound TV camera intended to show the other side of the moon to earth viewers. It is to send continuous lunar reflections from a 2½-inch mirror when the Pioneer gets near enough.



STICKY STUFF. Pressing buttons and twirling dials on the vending machine below at right dispense the correct number of trade stamps at supermarket check-out counters. It saves time for customers and clerks. The machine is made by Electric Vendors, Inc., Minneapolis.

America's Meanest Little Mountain

A killer, though thousands climb it every year, Mount Washington has the world's worst weather

By Gardner Soule

THE wildest weather known in the world is not that of Siberia, nor that of the Antarctic, nor that off Cape Hatteras (where the wind has reached 110 m.p.h.). It occurs, instead, right in the continental U.S., near crowded centers of population—where you can reach it and sample it easily. Each year thousands of men, women and children do.

The place you'll find the worst weather so far recorded is the 6,288-foot-high summit of Mount Washington, N.H., five hours' drive from Boston. Here, on April 11, 1934, for an instant there occurred the strongest wind ever measured: 231 m.p.h., or 99 m.p.h. more than the greatest breeze ever recorded elsewhere in the U.S., 132 m.p.h. at Miami. The Mount Washington record was the high point of a memorable 24-hour period

Neither the Arctic nor the Antarctic,

FOG has cut visibility to 200 feet in this photo. Fog, a killer on Mount Washington, has kept people from seeing safe huts a few hundred feet away. Air Force personnel (here) and other workers on mountain quickly learn never to go outdoors in winter without wearing full Arctic clothing. Even in midsummer, the fog can freeze into ice.

but Mount Washington, N.H.: As bleak a winter scene as there is anywhere and much closer to home.

RIME-COVERED JEEP had to be abandoned on summit. Fourteen storms last winter piled up 274 inches of snow on mountain, all-time record.

CHAINS ANCHOR BUILDINGS against wind. Wind often makes it colder than Antarctic, in spite of temperatures there down to minus 124.1.

SNOW almost buries building (man is clearing window near roof). Wind after storm is as bad as the storm itself: It coats buildings (as here), cuts visibility sharply, whips up snow.

SNO CAT is only vehicle able to climb the mountain in winter after the highway and cog railway have been shut down. Ice makes it a long, dangerous creep even for tractored vehicle.

BEST DUTY IS INDOORS on Mount Washington: Here observer Brook Vivian checks one of many gauges in observatory. Even indoors, it's below freezing a few feet away from stove or fire.

during which the wind averaged a furious 129 m.p.h.

You can reach the summit by car (there is a road all the way); by cog railway (which climbs one foot for every four traveled, and takes an hour and a quarter to cover 3¼ miles); or by hiking. Once atop the peak, the highest in the northeastern U.S., you're likely to encounter, even in summer, winds up to 100 m.p.h., snow, cold, and freezing fog.

Although the climb is so easy that gangs of schoolchildren march up and down each year without accidents, and a 300-pound girl once went up and back in a day, you should be warned that:

- Mount Washington is one of America's deadliest tourist attractions.
- Thirty-three people have died, many from freezing, exhaustion, or exposure, on or near its peak.
- Tragedies increase as the visitors to the mountain increase. There has been a fatal accident in almost every recent year. Last July, a college graduate student and his date set out one afternoon to hike to the summit. They were not again seen alive. When their bodies were found, mountain men guessed what probably had happened to them: In light clothing, they walked out of the summer day in the valley right up into a storm of wind, cold and rain that wore them out and sapped—as Mount Washington's storms do—both their will and ability to go any farther.

They were found, the boy's body trying to protect the girl, in a place where that kind of protection is impossible: on the summit cone of Washington, a bleak, rock-strewn, three-by-two-mile area, entirely exposed to gales from the Arctic, Canada and the Atlantic, a place so inhospitable to life that nothing but Alpine or Arctic shrubs can grow there.

They were less than 2,000 feet from heated buildings and safety on the very top, which they could not see, or had not the strength to reach.

"Of all the mountains that are easily accessible to men," says Bradford Washburn, one of America's outstanding mountain climbers, "Washington is one of the most dangerous."

Mount Washington has earned its reputation for a number of reasons.

Its amount of snow. This April, when the skiers arrive for the skiing season

Beautiful clouds over Washington can be treacherous: They bring rain, snow, fog, storms—death.

that sometimes lasts into July, they will be out to enjoy the 200 inches of snow the mountain is known to get each winter. That's five times what Minneapolis gets. There were 274 inches in 1957-58, the most so far, and nobody knows how much snow isn't measured because it is blown away too fast. This amount of snow can be as dangerous as it can be pleasurable: It causes avalanches. In 1955, one swept down over a skier, and smothered and froze him to death.

Blowing or drifting snow, after a storm, is just as bad in Mount Washington's winds as the storm itself: Visibility is reduced; the cold, icy crystals are painful when whipped into face or ears; and a skier's or climber's tracks can be erased as quickly as they are made.

The low temperatures. Three times on Mount Washington the mercury has gone down to 46 degrees below zero; once to minus 49. This, or the more common minus 25, may not be comparable to Siberian or Antarctic records, but it can be enough to set up severe shivering and chattering—the kind it takes hours to get over once you get into a warm place.

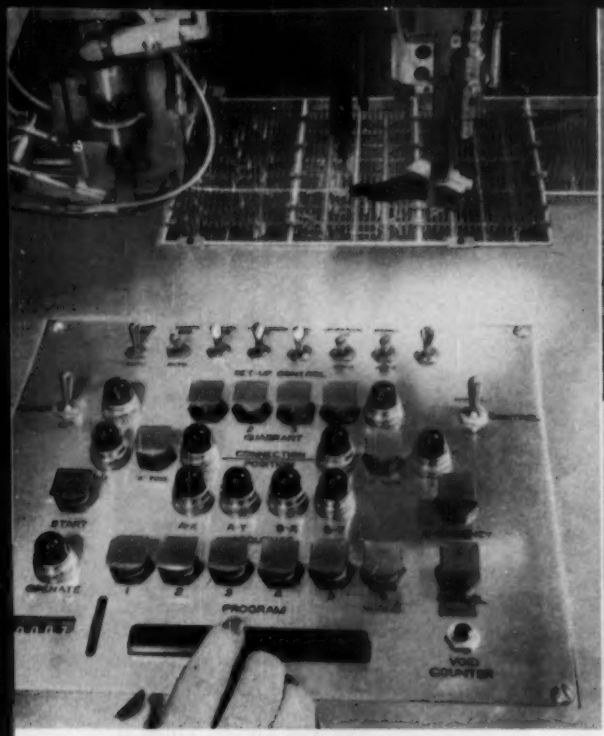
The reason Mount Washington is cold is a matter of altitude: The temperature decreases as you go up, and the rate of drop is usually about four or five degrees for each 1,000 feet you climb. Thus, if you start at around 2,000 feet high, where some trails begin, and the temperature is near freezing, on top of the mountain it will be 16 to 20 degrees colder. Sometimes the summit temperature is as much as 45 degrees below that at the base.

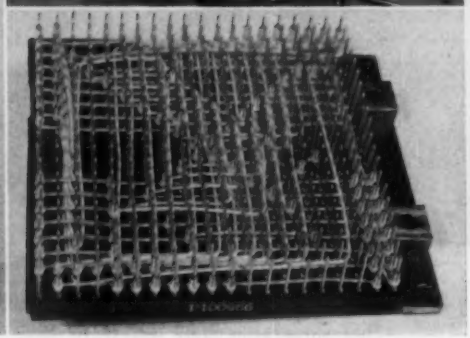
"No matter what time of year you climb Washington," says Fran Belcher, executive director of the Appalachian Mountain Club, "and no matter if you start out in shorts, have along clothing for winter. Wear climbing boots, wool socks, and carry a pack with long trousers, extra shirt, sweater, raincoat or parka."

The wind. The first man known to climb Mount Washington, Darby Field in 1642, found "a great tempest of wind." On the mountain and also on the slopes, where the skiers will cavort, natives say the wind blows so hard it takes two men to hold one man's hair on.

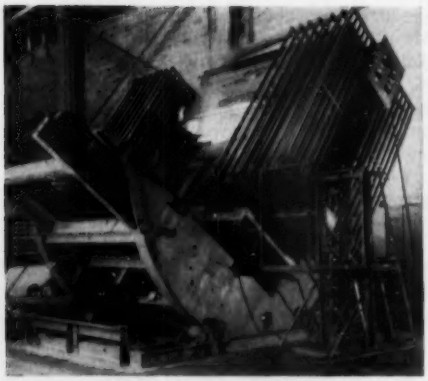
Back in 1883, when the Signal Service had a weather station on the mountain, a Sergeant Beals went out at noon to change the cups on an anemometer. The wind first wrenched his screwdriver away. Then it unwound the scarf around his head and carried it off. When the wind removed one of his overshoes and sent it

[*Continued on page 230*]





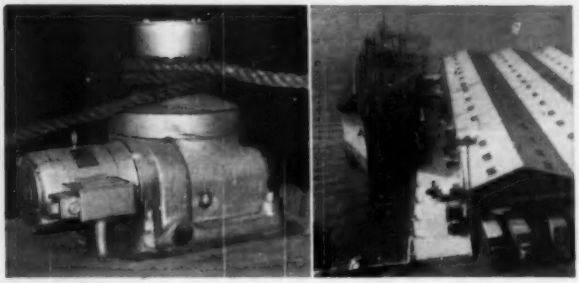
NIMBLE FINGERS. This $40,000 machine accurately wraps 10,000 wires in solderless connections on 20-inch panels (lower right) for an air communications system. Wire fed in at upper left in the keyboard closeup is transported by the carriage at right to the center dressing finger that makes connections. Gardner-Denver developed it for Hughes Aircraft.



BIG ROCKING HORSE. These motor-driven rockers were devised by GE welders at Schenectady, N.Y., to rotate gigantic transformer tanks in a 90-degree arc to put them in best welding position. Cranes hoist the parts for assembly.

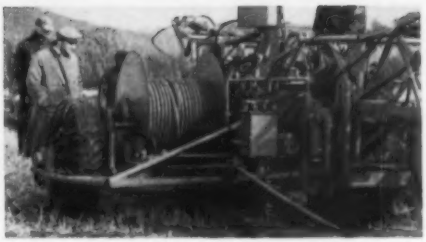
SUPER-LIGHT CAB. The new GMC tractor above has an all-aluminum tilt-cab, said to make it the lightest on the highways. Its front axle is set two inches back of the 48-inch-deep cab, uses a new kind of air suspension.

TANK STOPPER. A pistol-like firing mechanism held by an infantryman guides the British rocket at right straight to an approaching enemy tank. The rocket, carried in its 45-pound launcher, can be set up and fired by one man. The missile is 53 inches long, has a wingspan of 12 inches. It's accurate, hits anything that can be seen.



SHIP PULLER. This electric capstan (left) is one of six installed by the Port of New York Authority to warp barges and lighters around corners of a Brooklyn pier. It is run by a 10-hp. motor, pulls loads up to 5,000 pounds at 45 feet a minute.

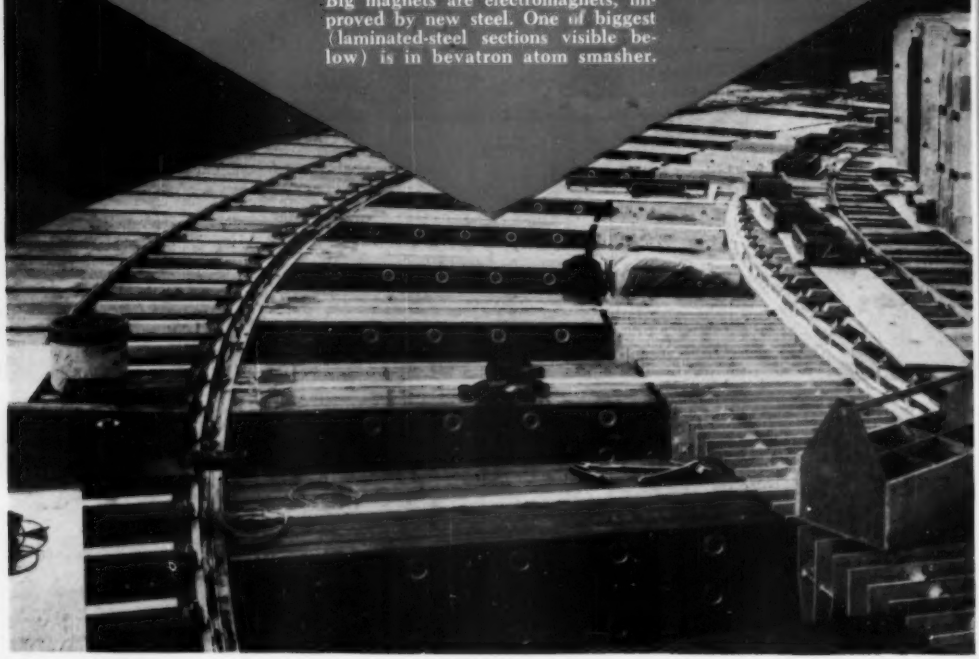
CRAB PLOW. This electric tractor, invented by a Scottish farmer, draws current from a power line and shuttles back and forth across the field, plowing first in one direction then in the other. It operates on a 30-hp. motor fed through a 500-yard cable and driving a pump that powers individual hydraulic motors in the two big wheels above. An outrigger wheel (right) acts as a stabilizer.



Small magnets are permanent magnets. New type can be soldered and drilled as well as cast in any shape—all impossible with the older magnets.

Revolution in MAGNETS Promises New Wonders in Your Home

Big magnets are electromagnets, improved by new steel. One of biggest (laminated-steel sections visible below) is in bevatron atom smasher.



Why is iron magnetic? Solving this ancient puzzle pays off in stronger and better magnets

By Martin Mann

"A BREAKTHROUGH like this makes you think about turning things upside down."

Thomas Paine, perched on the desk in his laboratory, was talking about magnets: the remarkably powerful and versatile permanent magnets that General Electric has cooked up from iron powder finer than cigarette smoke.

The things that ex-submariner Paine was thinking about turning upside down were some of the most ordinary contraptions in your life—small motors, pants fasteners, machine bearings, loudspeakers for TV and hi-fi—as well as some very unordinary ones:

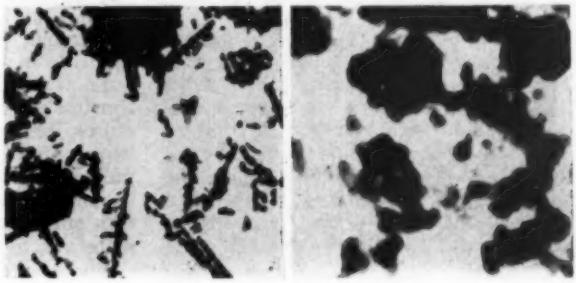
- Magnetic sponge-rubber weatherstripping. It would stick wherever you pressed it around a car-door frame.
- Magnetic storm windows. With magnetic weatherstripping edging a sheet of clear plastic, it would stick airtight to a steel window frame. Come summer you could pull it off, roll it up and put it away.
- Very small yet very efficient DC motors, their rotors permanent magnets instead of wire-wound electromagnets.
- Inside-out loudspeakers. Now speakers have heavy permanent magnets fixed solid to the end, while light electromagnetic coils attached to the paper cones make the cones vibrate. It might work better if the coil were fixed, motionless, with the permanent magnet built into the vibrating cone. The whole cone could be the magnet—thin plastic impregnated with fine magnetic powder.
- Magnetic zippers. Plastic or cloth impregnated with tiny magnets would make good clothes fasteners—fumbleproof and jamproof (but you'd have to watch out when walking near a big electric motor).
- Magnetic bearings. Electric meters already have them. The spinning aluminum disk floats in air, its support an invisible magnetic field induced by a magnet that never touches it. Stronger magnets could float bigger parts—clock gears, for instance.

MAGNET MAKER: GE's Dr. Thomas O. Paine checks pull of remarkable new permanent magnet he and associates developed. It can be 10 times as powerful as strongest now in use.

And there's more to come. For Paine's new magnets are unlike any ever made.

For one thing, they are extremely powerful. The ones that GE is now producing in pilot quantities are as strong as the strongest now manufactured. Potentially, they could be 10 times better.

But more important is their versatility. Magnets have always been heavy, hard



FINER THAN CIGARETTE SMOKE: Microscope shows ultrafine iron particles (near right, compared to cigarette-smoke particles at far right) that give new permanent magnets tremendous strength. Magnet is made by mixing particles with binder and then molding. This gives magnets of almost any shape.

and brittle, adaptable to only a few shapes. Not these. They can take on almost any form you want: hard and tough metal; soft, flexible rubber; light plastic; even transparent glass. You can bend them, cast them, drill and machine them.

The reason for this adaptability is that the magnetic part is pure iron powder, each particle so tiny that it can be seen only with an electron microscope. To make this fairy dust into usable magnets, you mix it with a binder. The binder can be anything: rubber, glass, plastic.

Actually, these iron-powder permanent magnets are just one gain from a more fundamental breakthrough—a new and thorough understanding of magnets and what makes them work. This new knowledge will change the way you live as dramatically as the discovery of electromagnetism a century and a half ago. It can bring new communication systems, better ways to drive cars, planes and spaceships, practical schemes for supplying power without wires. It could reveal the long-sought link between magnetism and gravity.

Magnets, magnets. You don't often see them, and when you do, they don't look like much, yet magnets make the world's wheels go round. There are puny permanent magnets with just enough pull to hold onto a can lid, and there are the fantastic electromagnets for scientists' atom-smashers, 10,000 tons of expensive steel and hundreds of miles of copper wire, powerful enough to pop spikes out of a plank.

Mostly, magnets—as electromagnets—are electrical machinery. They generate electricity in the powerhouse. They seesaw amperes and volts up and down in transformers to put electricity to work.

You probably have somewhere around 75 magnets in your house. (Count 'em: three or four in the washer, as many or more in the hi-fi, two on the door chime, eight in the TV set, and on and on.)

U.S. production of permanent magnets runs close to 200,000,000 in a year, with 40,000,000 marked for TV alone.

And, of course, magnets aren't new. The philosophers of ancient Greece pondered the strange behavior of lodestones (natural permanent magnets) from the province of Magnesia, whence the name. Columbus and his friends made brilliant use of them in the compass—to find the New World.

But in all those thousands of years no one understood the how or why. Today scientists do. They can explain magnets—the things that produce magnetic force. When it comes to the force itself—magnetism—the fog of ignorance settles once more.

Inside magnets. How come some iron pulls at other iron, silently, tenaciously, timelessly? How come different iron acquires this power only when electricity travels in a wire around it, reverses its pull when the electricity reverses, loses its pull when the electricity stops? And why only iron (there are other magnetic materials, too, but not many)?

The answers came as scientists pried

UNBALANCED ELECTRON-MAGNETS—more pointing one way than the other—make the whole atom a magnet. Electrons in some atoms are like that. But atom-magnets aren't enough.

ATOM-MAGNETS BALANCE, TOO, within most materials, with just as many pointing one way as the other. So again, their pulls cancel out, and no useful magnetic force results.

deeper inside metal atoms with the new and sharper tools of quantum theory. They found a gem: a beautiful example of the majestic simplicity with which Nature orders her universe. This is it:

All magnetism—permanent or temporary—comes from electricity. Any electric current generates a force that goes by the name magnetism. Everything in the world contains electric currents—spinning electrons inside its atoms. Each spinning electron is a magnet. For this basic magnetism to make itself felt in a usable piece of metal—which will contain an unimaginable horde of electrons—three things must happen:

1. The spinning electrons in each atom must line up so that more point one way than the other. Otherwise the electrons' magnetism cancels out.

2. The atoms must line up in groups called domains, otherwise the atoms' magnetism cancels out. Domains are big enough to be seen with a microscope.

3. The domains must line up so that most of them point in one direction, otherwise *their* magnetism cancels out.

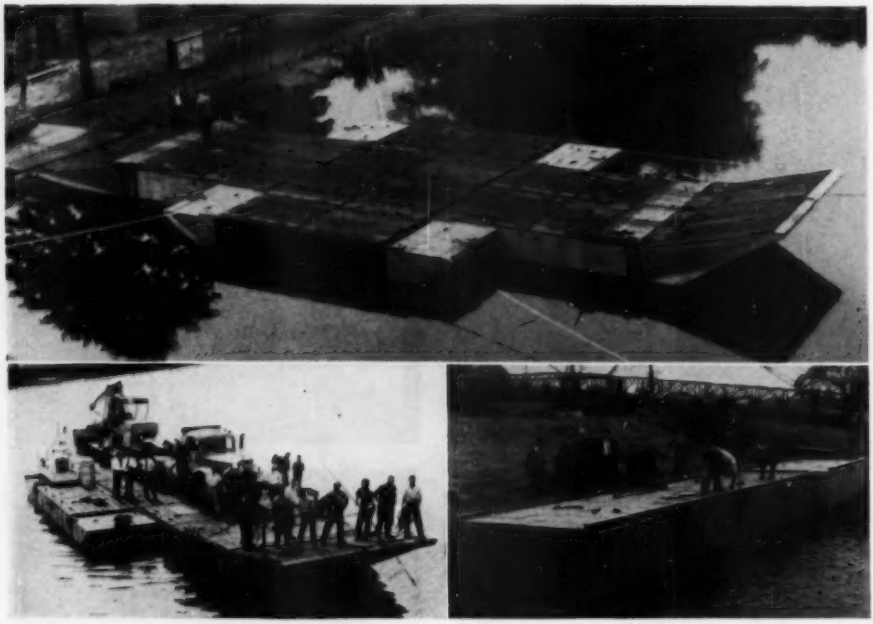
Only iron (and nickel, cobalt and a few other relatives) meet the first two requirements naturally. The theory shows how a few other materials can be forced to meet them, and has led to a good permanent magnet made of manganese and bismuth, both elements which normally are not magnetic.

Permanent magnets have domains that are difficult to line up, but once lined up

[*Continued on page 236*]

EXCEPT IRON (and relatives): These few elements have atom-magnets that line up in groups called domains, forming magnets big enough to be seen with a microscope. But again, the magnetic pull usually cancels out in bigger pieces of material: The domains pulling one way are just as big as the domains pulling the other way.

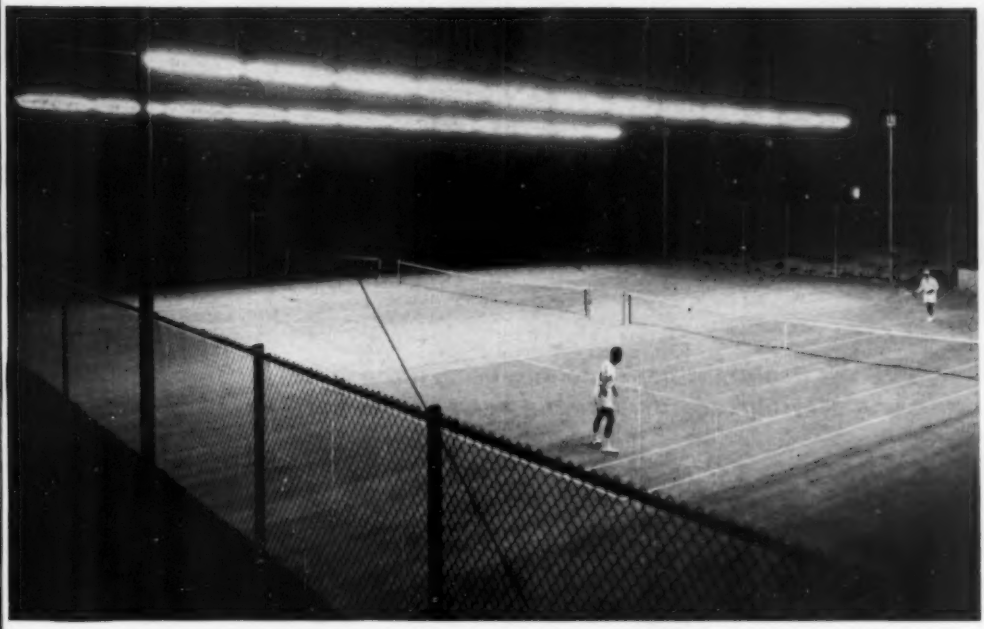
OUTSIDE MAGNETIC FORCE (from electricity or the earth's magnetism) makes some atom-magnets turn, like tiny compass needles. This increases the size of one set of domains at the expense of the others. The larger domains, all pulling one way, overbalance the smaller ones—and you have a magnet big enough to be useful.



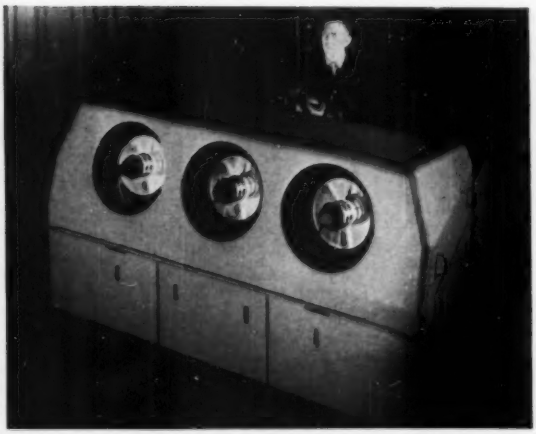
STEEL TANKS AFLOAT. Standard tank units, called Uniflotes by their British maker, can be assembled to form a landing dock (top), a ferry (left) or bridge supports (right). Aligned by pulleys, the sections are held together with hooked lugs under water, locking pins at deck level.

EAR ALARM. When your head nods if you doze off while driving, a pellet of mercury in this device levels, closes a circuit, buzzes in your ear. A battery powers the Driver-Larm, made by Wright Airborne Electronics, Kansas City, Mo.

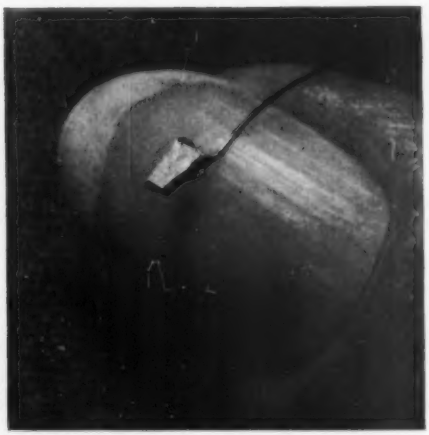
GOOSENECK HITCH. Tractor and semitrailer can clear turns up to 110 degrees with this linkage made by Steel Fabricators, Wales. The hitch also suspends the load below and ahead of the rear axle, giving drive wheels more grip.



NIGHT-LIGHT TENNIS. Fluorescent floodlighting at the Tucson, Ariz., Racquet Club is believed to be the world's first. Twelve units are suspended from two 125-foot-long cables 25 feet above the courts. "Far better than conventional lighting," says Australia's ace Adrian Quist.



BIG COLOR TV. Three projectors, one for each primary color, threw nine-by-12-foot pictures on a screen at a recent closed-circuit presentation before a Minneapolis medical meeting. North American Philips developed the equipment.



NEUTRON DETECTIVE. Dwarfed here by a fingernail, a millionth of an ounce of uranium on a slice of germanium is used by Westinghouse in tight corners of reactor cores. It maps patterns created by neutron pulses from split atoms.

New jobs for flashlight cells include everything from polishing shoes to playing records. Coming soon—truly portable TV sets

Clever New Gadgets Run on Flashlight Batteries

By Howard G. McEntee

YOU tell the clerk you'd like a couple of "large-size flashlight batteries." He asks what for. You suppress an urge to tell him it's none of his business, but he's right—it's very much his business.

A lot has happened since the days when flashlight batteries were used for flashlights. Today's big boom in battery power has been made possible by an amazing new assortment of pint-sized power plants, all of which *look* like flashlight batteries but do remarkably different jobs.

Today, you can shave by battery, listen to records by battery, mix cocktails by battery. You can power radios, movie cameras, dictating machines, Geiger counters, fire and burglar alarms, tape recorders, clocks, kitchen food mixers—all without plugging in an electric cord.

In the wonderful world of the future are such bright promises as battery-run power tools, truly portable TV sets and a variety of cordless home appliances.

Most of these run on flashlight batteries in name only. Big makers like Burgess, Eveready and Ray-O-Vac produce flashlight-like batteries in a dozen types and sizes. As Eveready says: "We even make flashlight batteries for flashlights."

Don't laugh, though. There are at least *three different kinds* of batteries that you can put in your flashlight, depending on how you want to use it. Picking the *right* battery for the job is more important than ever because there are so many more types to choose from. For instance:

- The *wrong* cell in a portable radio may put an untimely end to your favorite program.
- The *wrong* cell in your flashgun may work for a while, then fail to fire just when you're set for that perfect shot.
- Junior's toy that fizzled out the day after Christmas can be given a longer-lasting lease on life if you know how to buy more powerful batteries.

Be your own expert. You can't always count on the clerk at the corner store to guide you through the maze of modern packaged power. Some of the many new types are available only at special stores, such as radio or photo-supply shops. Often the battery that came with a device is a poor guide, since it may represent the cheapest, not the best.

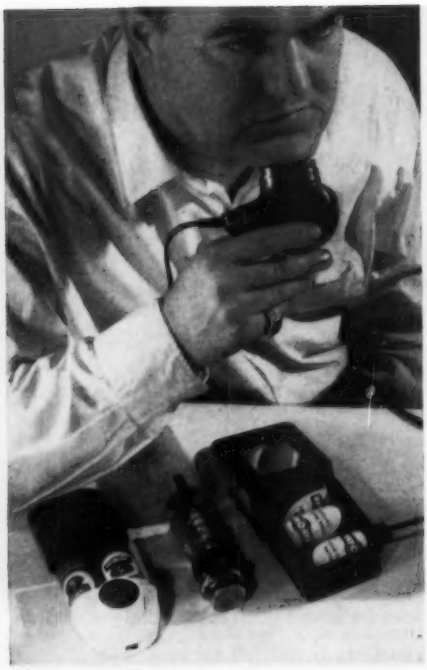
Some portable radios take either ordinary batteries, which must be replaced

SIX-POUND PORTABLE PHONOGRAPH, above, plays 6,000 times on one set of four ordinary flashlight cells, or can also use heavy-duty batteries for longer life. Made by Tri-Phi, Inc., of Albertson, N. Y., the three-speed, transistorized record player will sell for about $50.

frequently, or rechargeable cells that are renewed when you plug the set into a 115-volt house outlet. One frees you from replacing dead batteries; the other frees you from dependence—even partial—on a power cord. You have to decide which is handier for you.

What is a "flashlight" battery? Batteries of the "flashlight" type have two things in common:

- All, regardless of size, are designed to produce a nominal voltage of 1.5 (actual voltage may be slightly less and tends to drop faster in smaller sizes).
- Nearly all are of the classic carbon-zinc construction. You'll hear other



CORDLESS SHAVERS let you spruce up any time, anywhere. Swiss-made Lord Riam at left uses two D cells, is sold by Belf & Lustig, Elmhurst, N. Y., for about $13. Slim Universal model at center for about $17 runs on four AA penlites. Norelco at right (about $25) has a separate battery case holding three D cells, also runs on power from a six- or 12-volt car battery.

INEXPENSIVE HOME FIRE ALARM lets out a loud howl if temperature rises above 135 degrees. It's sold by Merlite Industries, NYC, for $4.95, will last a year or more on a pair of D cells.

strange names—alkaline, mercury, nickel-cadmium—but most of these batteries are made to supply different voltages and are not considered in the flashlight class, though some of them do come in flashlight sizes.

Unscrambling the sizes. Luckily for the buyer, battery makers and the National Bureau of Standards have cooperated in establishing five basic sizes of flashlight cells. "D" cells are the large, familiar "standard" size—about 1¼" in diameter and 2¼" tall. Next smaller are the ones that bring a smile to the clerk's face when they're described as "sorta like a flashlight battery but kinda smaller." These are "C" cells— about $\frac{15}{16}$" by $1\frac{13}{16}$"—and are used in small flashlights, lightweight flashguns and many toys.

Perhaps the most annoying experience is to buy a "penlite" cell, then discover that it doesn't match the old one at home. Actually, there are three sizes of skinny little cells that are often called "penlites." These are "AA"—$\frac{17}{32}$" by 1⅞"; "AAA"—25/64" by $1\frac{11}{16}$"; and "N"—$\frac{7}{16}$" by $1\frac{1}{16}$".

Don't, however, confuse battery *size* with battery *type*. All makers use the same *letter* markings to designate size, but each one uses a different *number* to designate type. You may have little choice in the size of battery you need if it has to fit in a given space, but you have a lot of choice in the *type* you pick:

Flashlight cells for flashlights are just that. Called general-purpose batteries, they're intended to give good service under the light, few-minutes-on, many-hours-off kind of duty that is typical of flashlights. But hook one up to a heavy-drain appliance, such as one that has a motor in it, and you may run it down in half an hour. This is why many battery-powered toys go dead after only a few hours' use.

Industrial flashlight cells are heavier-duty versions of the general-purpose type, but they are still designed for the same intermittent duty rather than for continuous heavy drain.

Eveready compares its industrial No. 1050 cell with its general-purpose No. 950 cell like this: With a load of .3 amps (comparable to an industrial flashlight bulb) applied intermittently to each one for a total of two hours a day, the industrial cell gave 13 hours of service, the general-purpose one six hours.

Should you use industrial cells in your own flashlight? Only if you depend on them for constant use every day. Otherwise, they're likely to die of natural causes before you get full value.

Photoflash cells are a different breed entirely. They're designed to give the large amounts of current required to fire a flashbulb, but only in short bursts a fraction of a second at a time.

Ordinary batteries will fire a bulb, but may not reach full power output fast enough to fire it at the exact instant required to synchronize properly with the shutter. The reason? Flashlight cells have a peak current of six to eight amps, photoflash cells up to twice that. But don't use photoflash cells in your flashlight or radio—they'll do very poorly.

Radio batteries, unlike those for intermittent or instantaneous duty, are made especially for portable radios and other devices that may be run several hours a day, day in and day out.

Two types are available, and here the pick is important: Cells for conventional tube-type portables are made to withstand the moderately heavy current drain of the filament-heating circuit.

Cells for transistor portables are similar, but are made to last much longer

YOU CAN MIX COCKTAILS and other drinks away from home on two D cells in the mixer above. It's sold by Sibert Mfg. Co., Newark, N. J., for about $10. Batteries last several months.

How to Tell Which Battery to Buy

TYPE OF BATTERY	SIZE	APPROX. PRICE (cents)	MATCHING CELLS OF FOUR BRANDS				USES
			Bright Star	Burgess	Ever-eady	Ray-O-Vac	
GENERAL-PURPOSE FLASHLIGHT	D	20	10M	2	950	2LP	Flashlights; light, intermittent duty in toys and novelties that do not require power for motors
	C	20	11M	1	935	1LP	
	AA	15	59	Z	915	7R or 7LP	
	AAA	13	58	7	912	400	
	N	13		N or NE	904	716	
INDUSTRIAL FLASHLIGHT	D	25	10MC	210	1050	3LP	Heavy, constant use in flashlights
PHOTOFLASH	D	25	10P	220	850	210LP	Flash bulbs and some electronic flashguns
	C	25	11P	120	835	110LP	
	AA	20	59P	920	815	710LP	
RADIO-ELECTRONIC	D	25	10M	230	A100	13	Transistor radios; other electronic uses
	C	25			635	14	
	AA	20			1015	15	
	D	25	10MC	2R	D99	5LP	Tube radios; motor-driven devices, hearing aids, and other heavy-drain uses
	C	20	11P	130	635	1LP	
	AA	15	59P	930	1015	7R or 7LP	
	D	20				6LP	Sold mainly for toys and novelties
	C	20				10LP	
VERY HEAVY DUTY (alkaline cell)	D	75			E95		Flashguns, motor-driven, other heavy continuous-drain uses
	½D	50			E94		

NOTE: Where entries are duplicated, batteries are said by their manufacturers to be suitable for more than one use.

NEW COMPACT ELECTRONIC FLASHGUNS run on three D-size cells stored right in the handle, eliminating both flashbulbs and separate power packs. You can use conventional photoflash batteries at left (25 cents apiece for about 200 flashes), high-power Eveready E95s at center (75 cents apiece for about 500 flashes), or rechargeable cells at right (about $5 apiece) that last for years. The Heiland flashgun shown sells for about $60, can also run on 115-volt house current when used for indoor shots.

under a lower current drain. Burgess, for instance, says their No. 2R cell for tube radios will last 90 hours when drained at 60 ma. for four hours a day, while their special No. 230 cell for transistor portables, drained at only 20 ma., will last up to *525 hours*.

Some radios come from the factory equipped with "ordinary" flashlight cells. For an extra nickel, it will pay you to switch to the correct type of radio cells—you won't replace them as often.

Radio-type cells are also good buys for many other continuous-duty devices—battery-powered clocks, movie cameras, projectors, tape recorders, electric shavers, Geiger counters, portable phonographs and toys with motors.

The accompanying chart lists equivalent battery types of four widely sold brands to help you in making a choice. Because of differences in manufacturing, not all of these are exact duplicates, but they will serve as a rough guide.

One super-heavy-duty cell has just been added to the list. This is Eveready's D-size E95 (also available in a new ½-D size, called E94). Although an alkaline cell, rather than conventional carbon-zinc, it is designed to be interchangeable with other 1.5-volt flashlight batteries.

The little E95s are both spectacular and expensive. They withstand heavy abuse under either intermittent or con-

PORTABLE BARBECUE SPIT has a tiny six-r.p.m. motor that screws onto a two-cell flashlight—which also serves as a flashlight. The spit, complete with flashlight, is sold by L R K of California, Redwood City, Cal., for about $10.

COMING SOON ARE BATTERY-RUN TV SETS like this midget 10-pound GE portable. Motorola is also planning a similar set for sale early next year that will run on its own batteries, your car battery or on 115-volt house current.

TWO TINY RECORDERS run for months on four regular or heavy-duty flashlight cells. Soundscriber dictating machine above records on mailable discs that can be played back on any 33⅓-r.p.m. home phonograph. Transistor tape recorder at right, a German product imported by Matthew Stuart & Co., NYC, weighs only five pounds, plays 70 minutes on dual-track tape.

tinuous drain. In certain jobs, they last up to 10 times longer than ordinary cells. And they perform at temperatures from 40 degrees below zero to 200 above, while other batteries are of little use below zero or above 130.

But at 75 cents apiece, they cost three times as much as other batteries. You may find them useful if you count on a flashgun to work in sub-zero weather or for very heavily used radios and appliances that eat a lot of canned juice. For general duty, the E95s are still luxury power.

Batteries are better than ever. Remember when you used to look for a stamped date on every battery to be sure it was fresh? Remember when you paid extra for a so-called "leakproof" type?

Modern batteries last so much longer than their elder brothers that dating is no longer necessary. Thicker walls and special sealing tricks also make nearly all batteries virtually leakproof.

Ray-O-Vac's "sealed-in-steel" container prevents corrosive chemicals from spewing out even if they eat through the inner zinc container. Burgess adds a "chrome inhibitor" that slows down deterioration when a cell stands idle. Eveready uses a unique "inside-out" construction for its special-purpose D-size cells. Instead of putting the easily eaten zinc on the outside with the carbon electrode in the middle, it puts the zinc in the middle with an outer casing of carbon that can't corrode.

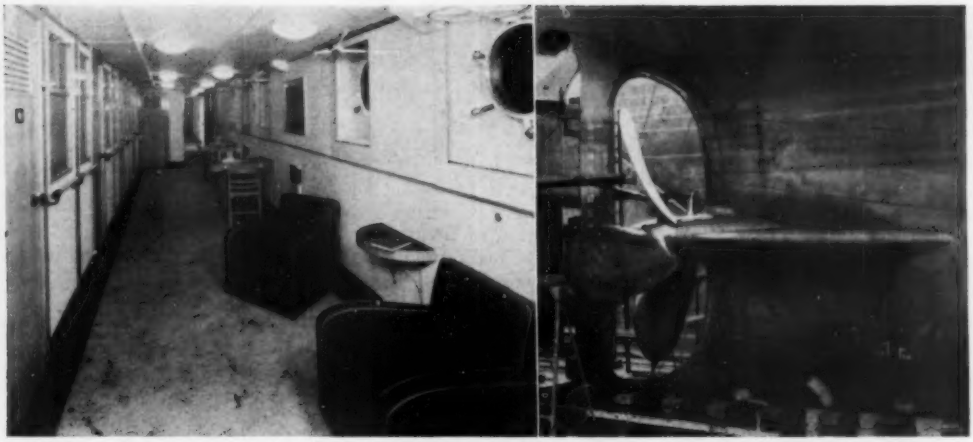
INTERCHANGEABLE BATTERIES like these for portable radios give you a choice: Special D cell at right lasts well but needs daily charging on house current. Away from home, you can run set on four penlite cells in plastic case at left.

TREND TOWARD EASILY OBTAINABLE CELLS is seen in camper's lantern sold by Ray-O-Vac. If special six-volt lantern battery is not available, light will run on eight ordinary flashlight cells that can be bought anywhere. END

HIGH-HAT TRAMP. The cargo ship Weybridge is a sailor's dream, and has even borrowed seaworthy features from several fish. There is a private, air-conditioned cabin for each crew member. Above is the chief engineer's day room, and next to it the navigator's lounge. And, of course, there's a deck swimming pool for all. Edmund Watts, chairman of the

TURNTABLE LAB. When these students have finished an experiment, the flick of a switch rotates another laboratory setup into position. The unit was designed by two University of Illinois physics professors for small colleges.

BY LAND OR BY SEA. Goliath is the Navy's newest amphibian. On four tracks it can haul 100 tons over land at 13 m.p.h. Two retractable propellers plow it through water at seven m.p.h. Twin 500-hp. engines power the vehicle.



Britain Steamship Co., for which the 487-foot, 10,500-ton ship was built, is a student of the swimming habits of fish. The flap (far right) just forward of the propeller, adapted from the blue tuna, creates water turbulence which, he says, adds a half knot to speed, saves fuel. From the salmon come bow "shoulders" that throw heavy seas away from the ship.

KEYBOARD FLUTE. Holes are replaced by piano-like keys on the Melodica (below), which was recently introduced in West Germany. The manufacturer, Hohner, claims that this unusual arrangement makes the musical instrument easier to play.

CROP-DUSTING ATOMIZER. A wind-driven fan behind the can (top photo) forces liquid chemicals through a screen, creating a mist. Less than half the usual amount of chemicals per acre is needed with this British dusting plane.

What's New

for the family car

BLAST OFF carbon-fouled spark plugs with a jet stream of carborundum grit. Distributed by Sports Car Entrepreneurs, the plug cleaner works on air supplied by a hand or foot pump, or compressor.

Can't bear to leave the TV set? Take it with you to the woods, mountains or beach and plug it into a $42.50 (and up) inverter that plugs into the cigarette-lighter receptacle. It turns six- or 12-volt battery power into 120-volt AC current. American Television and Radio Co. makes it to operate a tape recorder, dictating machine, shaver, and drink mixer as well as the TV set . . . Two-and-a-half ounces of a fine powder made by U. S. Rubber Co. poured into each tubeless tire may save you a roadside flat. The powder plugs a puncture that otherwise would quickly lose air, enabling you to drive hundreds of miles to a service station. The light powder doesn't affect wheel balance.

Owners of foreign cars held together with metric bolts can tinker away with an 11-piece metric socket set at $9.95 or a 15-piece set at $19.95 made by Penens Tool Corp. . . . Serious engine tuners will find a useful tool in a proximity tachometer fitted with a range switch and multiple scale for measuring the r.p.m. of two- and four-cycle engines having one to 12 cylinders. A single lead is simply placed beside the high-tension wire at the coil. Fox Valley Instrument Co. sells it for $72.50.

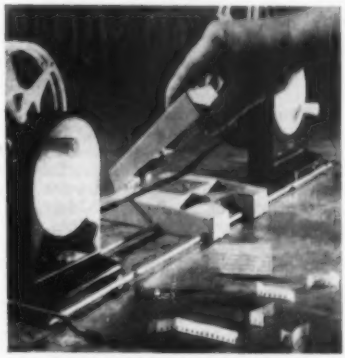
YOU BUILD THIS ALL-YEAR TRAILER on a basic trailer chassis made by Montgomery Ward. Detailed plans sold by Outdoor Industries for $4.95 show how to make and assemble the parts on the chassis. With sides up (above left), the trailer is an all-purpose utility or camping rig. In seconds, the tailgate can be removed and the front gate and sides folded flat as shown at right, putting adjustable rubber rollers in position for hauling a boat.

DRIVE-ON CAR RAMPS made of welded steel angle provide clearance for home lubrication and maintenance. A stop bar prevents over-run. Peduzzi International distributes the ramps.

for your home

Painting this spring? You'll find many painting aids in hardware stores to speed the job and make it easier. A 98¢ guide that clips to the side of a brush will help produce an even line around doors, windows and trim. The guide swings out of the way when the brush is dipped. Kurdon, Inc., makes it for brushes 2″ to 4″ wide.

A new Ladder Caddy clamps to any ladder to hold a gallon of paint, brushes, and wire brush securely within arms reach. Deejay Mfg. sells it for $6.95 . . . A safety ladder made by Novel Products has an extension frame that braces you while you stand on the broad top step—you'll feel as though you're on a balcony. All aluminum, it's made in 5′, 6′ and 7′ lengths at $10.95, $13.95 and $16.95 . . . For those who don't like ladders, Pittsburgh Plate is selling a 9″ roller with shielded bearings for easy rolling and an extension pole



NO MORE SCRAPING AND CEMENTING with a new Kodak movie-splicing outfit. The $13.90 Presstape splicer makes an overlapping cut in 8- or 16-mm. film and pressure-sensitive tape is then applied to both sides to join the film.

MORE PAINTING AIDS include auxiliary tops for paint cans. The light-colored tops are made by Western Mineral Products to raise the level of quart and gallon cans for adding color or thinner without slopping over. The other tops by Kay Enterprises have a spout for easy pouring and a built-in magnet to hold a brush suspended by its metal ferrule. Sun Plastic makes a similar type (not shown). Prices range from 19¢ to $1.19 for the gallon-can size with a magnet. After painting, you can store brushes in a Donaldson Brush Bath (right). Wire clips dangle them in a solvent that keeps bristles soft. A vinyl cover seals the can with brushes in it.

THE LUXURY OF LEATHER can be had on walls and floors for about $1.25 a square foot with new Pigs-Kin tiles made by Kiefer Tanning Co. The tiles are made of genuine pigskin leather and are cemented in place. Light waxing helps retain their smooth feel and mellow color.

for easy reaching. You can paint the ceiling while standing on the floor.

Before you make repairs on the lawn this spring, consider installing an underground sprinkler system. A 1,200-square-foot starter set from Everhot Products costs $39.95, and because it's a self-draining system of polyethylene pipe, you need set it only 4" beneath the surface. Spray heads pop up when water is turned on . . . Also in the plumbing department: a set of 98¢ dials to install behind tub and shower faucets for adjusting water to just-right temperature. There's no thermostat; just remember the numbers on the dials when you enjoy a comfortable shower and next time turn the faucets to the same numbers. Order dials direct from Howard Stevens . . . A plastic patch, called Platch, is said to mend anything. To use it as a glue, or to fill in car-body dents, smashed boat hulls or concrete steps, mix an ounce of Humphrey-Wilkinson's Platch with just two drops of hardener. After 30 minutes it can be sanded, sawed, drilled and painted . . . Latest aid for playing ping pong in cramped quarters is a table that not only folds in half, but rolls easily out of the way on its own casters. Made by Haldeman-Homme Co., the table is locked against rolling in use.

for more information:

Here's where to write if you can't get any item listed: **American Television and Radio Co.**, *300 E. Fourth St., St. Paul, Minn.;* **Arkay Corp.**, *4034 N. Kolmar Ave., Chicago;* **Arrow Metal Products Co.**, *421 W. 203 St., NYC 34;* **B & I Manufacturing Co.**, *Burlington, Wis.;* **Deejay Mfg. Co.**, *P. O. Box 5816, Minneapolis 19;* **Disston Division, H. K. Porter Co., Inc.**, *29 Tacony, Philadelphia 35;* **Donaldson Co., Inc.**, *St. Paul, Minn.;* **Eastman Kodak Co.**, *Rochester 4, N. Y.;* **Everhot Products Co.**, *2001-09 W. Carroll Ave., Chicago;* **Fox Valley Instrument Co.**, *Cheboygan, Mich.;* **Haldeman-Homme**, *St. Paul, Minn.;* **Humphrey-Wilkinson, Inc.**, *100 Devine St., North Haven, Conn.;* **Kay Enterprises**, *15 Hemalin Rd., Cranston 10, R. I.;* **Kiefer**

what's new in tools

Now you can cut a full dado in a single pass with a portable-saw attachment. Arrow Metal Products has designed an adjustable wobble arbor for their drill-powered Arco saw. A setscrew adjusts the conventional saw blade to the amount of wobble needed to cut any width groove up to ½" . . . A Lazy Susan tray with a pivoting arm that clamps to a drill-press column keeps drills, oil can, chuck key and other accessories conveniently at hand. B & I Mfg. Co. sells the tray for $4.85.

Time to put the lawn mower in shape! Nicholson makes a special file for sharpening rotary blades. It's a broad-tang file in a plastic case at 98¢ . . . A 69¢ blade balancer by Arkay Corp. helps check the blade's balance as you file it sharp. Your mower will run smoother with a balanced blade.

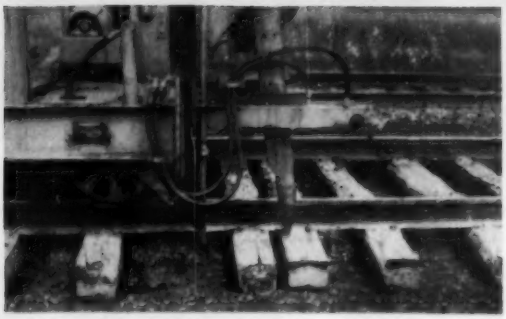
A portable jigsaw becomes a bench tool when mounted upside down in a $12.95 steel table. Thor makes the table to fit their No. 440 and 441 saws. It comes with a rip guide, miter gauge, and rubber feet to keep it from creeping.

LATEST IN KEYLESS CHUCKS: a massive ½" toolroom chuck made by Supreme Products for use in a lathe or drill press. T-shaped jaws slide in ground guides for maximum accuracy, and ball-bearing tightening provides a slip-proof grip with the advantage of easy opening. Price of the chuck is $18.

ALL-POSITION HANDLE encircles the body of this hedge trimmer for comfortable operation in any position without stopping to change over a movable handle. Disston makes the trimmer with a tangerine-colored cord that's too bright to be accidentally cut because it wasn't seen. Price is $49.50 with pigtail cord. Color-cord extensions are available in 25', 50' and 100' lengths.

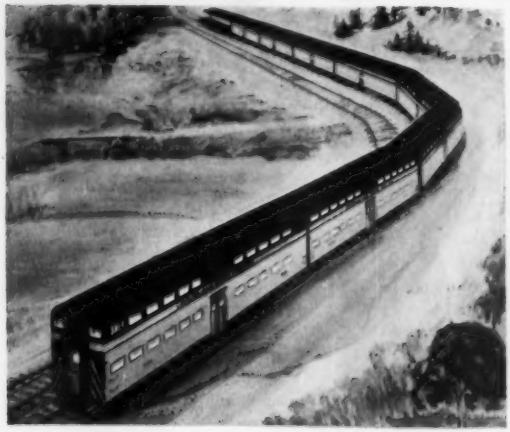
ALMOST ANY SHAPE you can imagine will fit between the jaws of the vise above. Two pivoting jaws mounted on a rotating turret adjust themselves as the vise is closed to distribute holding pressure for a firm grip. The cutaway sketch illustrates the flexible action of the jaws and turret. R. S. Wilder, Inc., sells the clamp-on model shown for $39.95 and a swivel-base model with the same jaw arrangement for $44.95.

International Products, *240 Front Ave., Grand Rapids 2, Mich.;* **Kurdon, Inc.,** *2320 S. Western Ave., Chicago 8;* **Nicholson File Co.,** *Providence 1, R. I.;* **Novel Products, Inc.,** *North Creek Road, Bellmaur, N. J.;* **Outdoor Industries,** *Rt. 4, Excelsior, Minn.;* **Peduzzi International, Inc.,** *P. O. Box 68, Huntington, N. Y.;* **Penens Tool Co.,** *Schiller Park, Ill.;* **Pittsburgh Plate Glass Co.,** *632 Fort DuQuesne Blvd., Pittsburgh 22;* **Sports Car Entrepreneurs,** *Box 462, White Plains, N. Y.;* **Howard Steven Gifts,** *7025 Melrose Ave., Hollywood 38, Cal.;* **Sun Plastic, Inc.,** *2634 Vincent St., Cuyahoga Falls, Ohio;* **Supreme Products Corp.,** *2222 S. Calumet Ave., Chicago;* **Thor Power Tool Co.,** *175 North State St., Aurora, Ill.;* **U. S. Rubber Co.,** *Akron, Ohio;* **Western Mineral Products Co.,** *1720 Madison St. N. E., Minneapolis 13;* **R. S. Wilder, Inc.,** *26 Bedford St., Waltham 54, Mass.*



Tie Spacers. Hydraulically controlled tongs of these Pullman-Standard machines grip replacement ties, or ones to be respaced, and align them at right angles to rails. Then with powerful electromagnets gripping the rails, the four-ton rigs pull themselves forward the required spacing distance, tugging the ties with them.

New Ways to Run Railroads



Push-Pull Train. Diesel-powered suburban train on the Chicago and North Western will run without turn-arounds or car switching. Chicago-bound, the locomotive will push its train, operated from controls in the car that would normally be at the rear. Out-bound movements will be conventional. With the locomotive placed this way, unneeded cars can be left on terminal tracks.

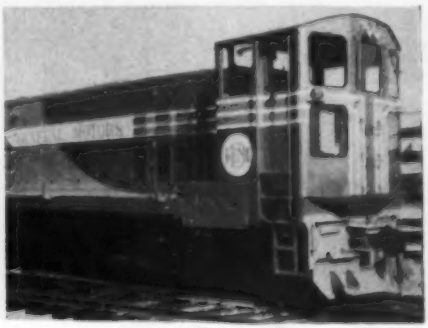
Morning: Full-length train runs backward to Chicago, engine pushing. Evening: It runs out forward.

Off-peak hours: Leaving some cars at the terminal, the train makes several "pull-push" shuttle runs.

Atomic Car Weighing. Gamma rays from a lead-shielded box between the rails penetrate cars passing over this New York Central "scale" track. Amount absorbed is measured by an overhead counter. Computer then figures payload weight.

Ambulance for Alaska. To get closer to more places, this unit can travel on both road and rail. The hydraulically operated guide wheels supplied by Fairmont Railway Motors have rubber treads.

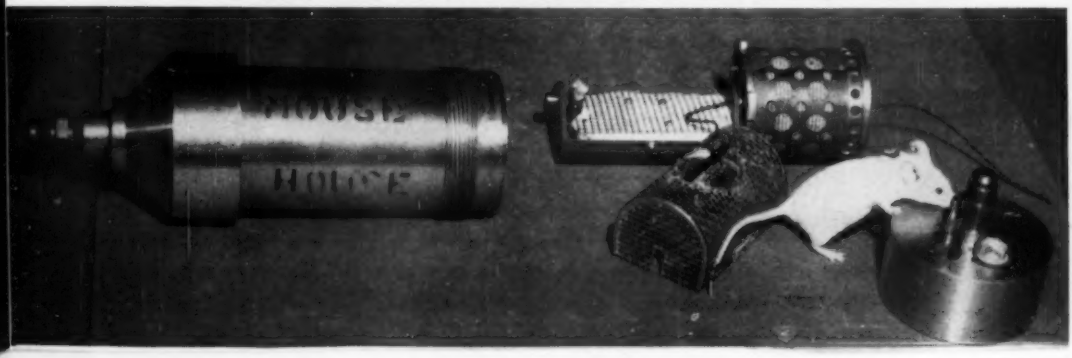
Pint-Size Diesel. Only half the weight of many 600-hp. American switchers, this new General Motors midget develops 800 hp. It's designed for use on small lines in South America, Asia and Africa.



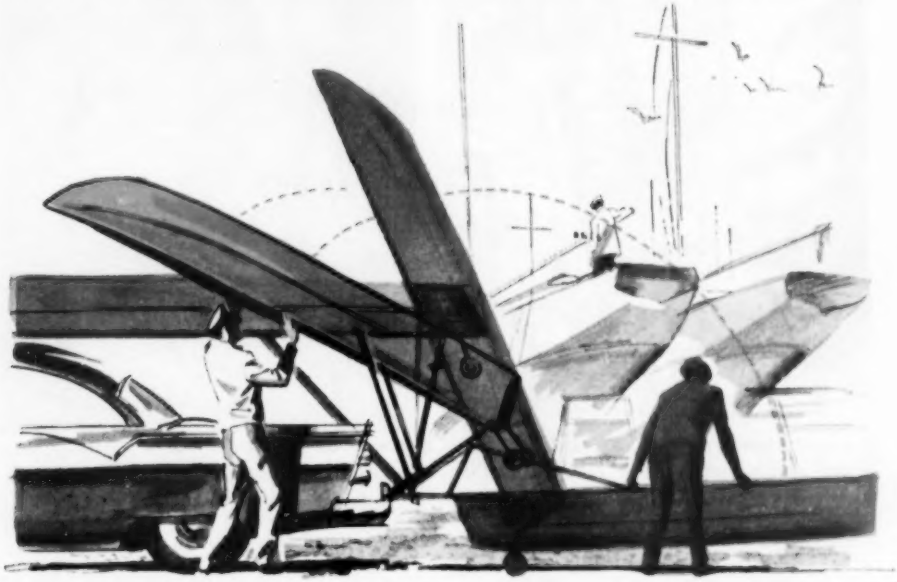
GAS A LA CARTE. This rolling filling station pumps two grades of gasoline, dispenses oil, free air, battery and radiator water. It was built by American Petrofina for a shopping-center parking lot in an Oklahoma City suburb. Pumps and compressor run on a battery-operated 2½-hp. motor.

SKY WAGON. Army Ordnance is testing the new personnel carrier at right. It is built like the current M-59 steel carrier but is made of aluminum, light enough to be air-lifted and parachuted quickly into troubled areas. It will carry a squad of infantry over rough or muddy ground. Here it is shown taking a ditch on a test track at San Jose, Cal.

SPACE MOUSE. The mouse Benji below examines part of a capsule that later carried him 5,000 miles in the nose cone of a Thor-Able missile. Telemetered tests conducted by Space Technology Laboratories for the Air Force showed no ill effects. His cage and cradle are behind him.



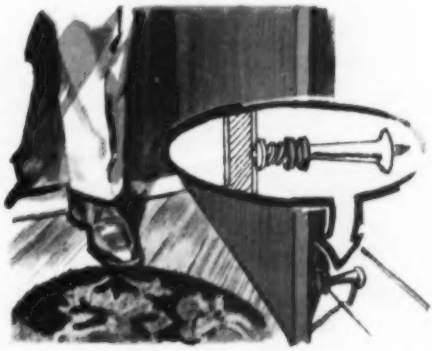
New Ideas from the Inventors



1 Carrier Helps Lift Boat. Using this recently patented device, one man could swing a boat on or off a car roof. Pivoted arms, hooked to the bumper and oar locks, would form a fulcrum around which even a large boat could be levered up and over. Wheels on lever arms would help in maneuvering to or from the car.

2 Soldering Iron Strips Wires. Most electric and electronic hookup jobs would go faster if you had a V-notched insulation stripper looped over the tip of your soldering iron. Heated by the iron, the stripper's claws would soften and sever most types of insulation.

3 Magnetic Stop Holds Door. An iron or steel button and a meeting, magnet-tipped door stop would keep an open door from chattering or being swung shut by drafts. To cushion and silence metal-to-metal impact, a spring would be built into the door-button half of this unit.



Please turn the page for more new ideas

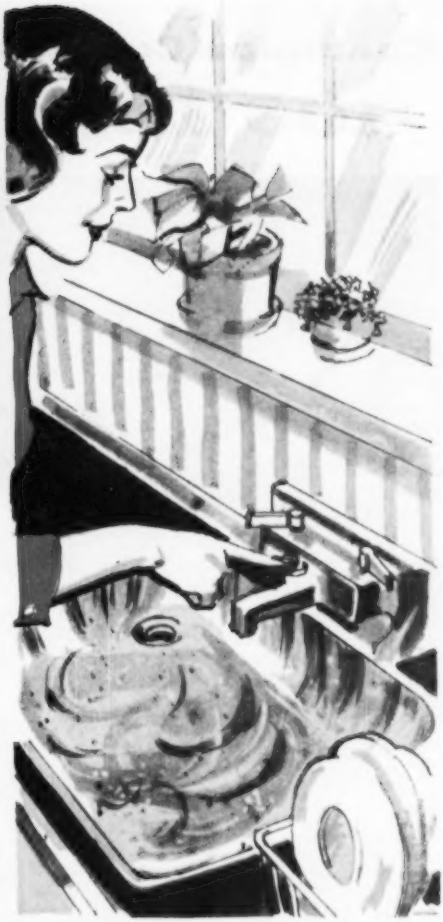
4 Level Shows If Ladder's Safe. A ladder that's angled too steeply could tip over backward, while one that's set too low could slip out at the base. This side-rail bubble tube—adjustable for concrete, grass, or other footing—would tell you at a glance if the angle is right.

5 Fanciful Needle Diverts Child. The sight of a hypodermic is often worse than its bite, believes one physician. He'd disguise his needles with rubber hoods shaped to distract young patients. The needle might hurt less, too, because of the hood's "secondary pressure" on the skin.

6 Weather Adjusts Road Signs. Temporary speed limits and warnings would be posted automatically by this electronic highway monitor. Light meters, moisture gauges, thermometers, traffic counters, and other sensing devices would feed data to an integrator circuit which would then light up appropriate sections of the sign.

7 Tilt Light Shows Clock. You'd do less groping when you wanted to tell time in the dark if you had a flashlight like this built into—or clipped onto—your bedside clock. A tip-switch in the battery-operated light would turn on when you tilted it slightly forward.

8 Glass Case Cleans Glasses. You could wipe extra visibility into your spectacles before you put them on if you carried them in a case like this. Wiping pads and knobs would be set into the sides of the stiff, envelope-like holder; the pads would cushion the lenses while they were being carried, then wipe them clean when you moved or twisted the knobs.



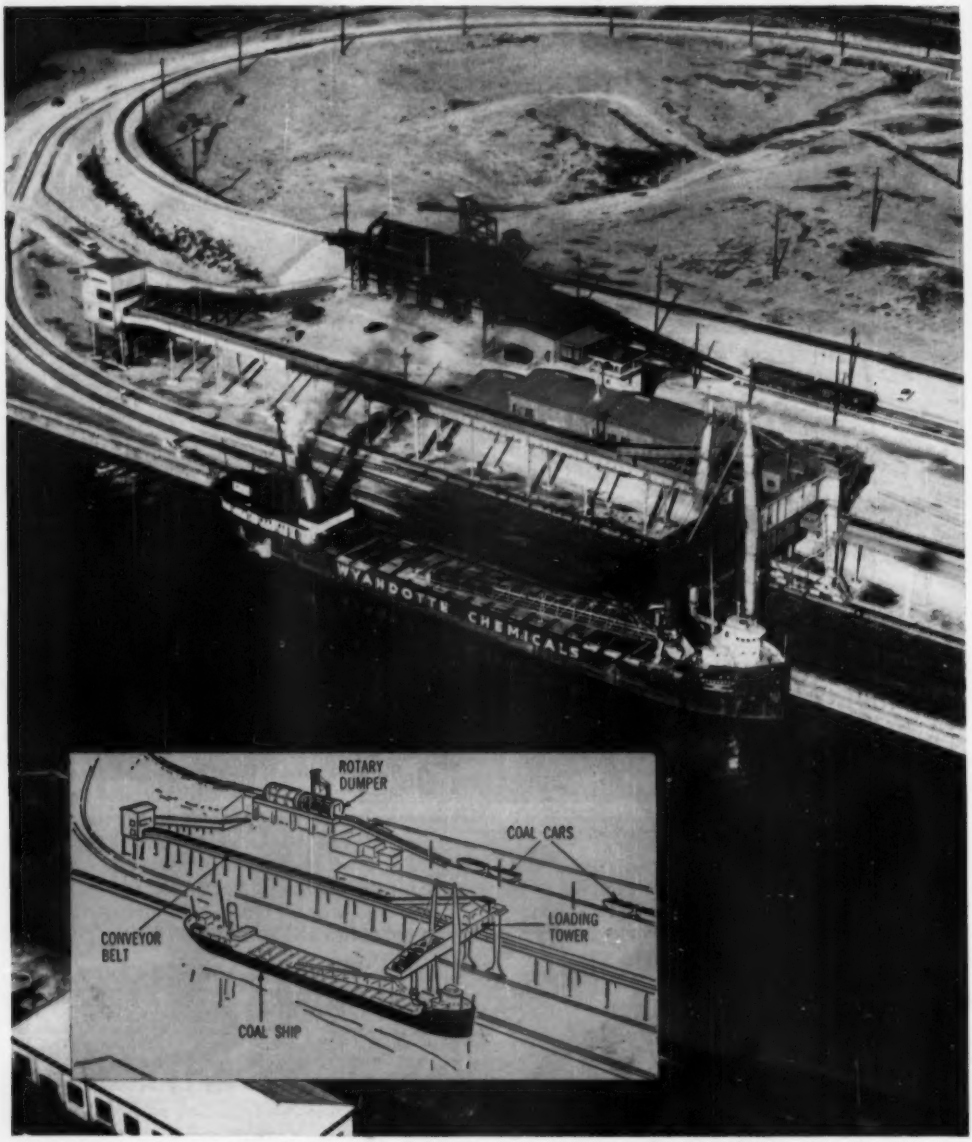
9 Sink Washes Itself. Splash-free sink cleaning would be quicker and simpler if you could flow water around the upper rim of the basin and down the sides. This GM patent also covers a selector control for mixing hot and cold water and routing it to the faucets, the rinse ring, or a conventional spray.

The following patents *have been issued on these inventions: 1. Patent No. 2,753,063 to William T. Abel, Cadiz, Ohio; 2. No. 2,763,170 to Albert Karem, Santa Monica, Cal.; 3. No. 2,761,718 to Robert A. Tool, Cambridge, N.J.; 4. No. 2,845,-719 to Hubert J. Thomiszer, Skokie, Ill.; 5. No. 2,845,065 to Daniel Gabriel, Bonny Blue, Va.; 6. No. 2,849,701 to Louis P. Clark, Broomall, Pa.; 7. No. 2,763,773 to Daniel S. Morente, Atlantic City, N.J.; 8. No. 2,762,500 to Kendrick T. Parsell, Manhasset, N.Y.; 9. No. 2,847,681 to J. W. Jacobs, Dayton, Ohio.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

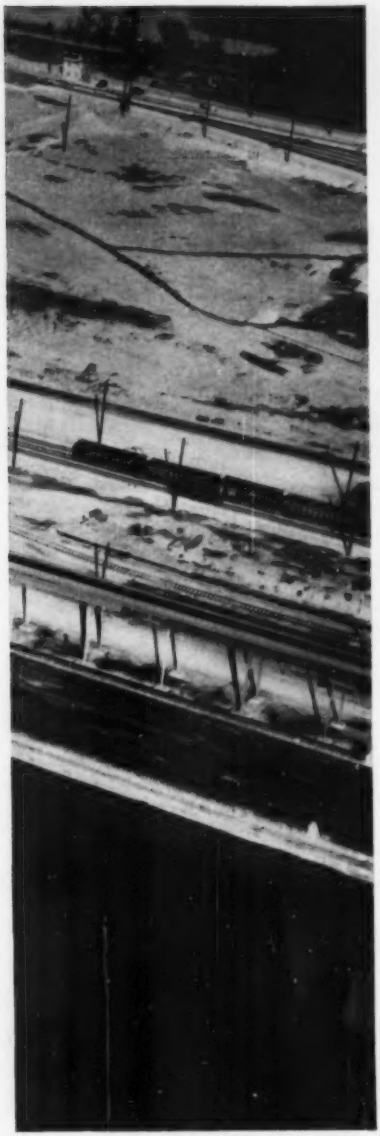
Champion Coal Loader Spews

100 Tons a Minute



Pairs of railroad cars are pushed up a ramp to the rotary dumpers and emptied. Coal lands on

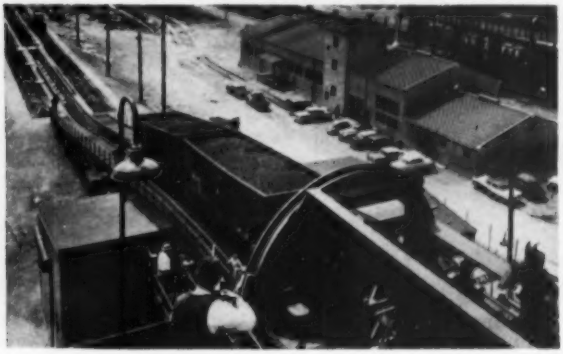
COAL at the rate of 6,000 tons an hour can be poured in a steady stream from railroad cars to ships by a new $7,000,000 mechanical monster at Toledo's Presque Isle. Designed and built by the Chesapeake and Ohio Railway, with assistance from American and German engineering firms, it is expected to increase C&O coal-dumping capacity at its Presque Isle docks by more than 40 percent—to over 26,000,000 tons a year. Now C&O is ready for Seaway ships.



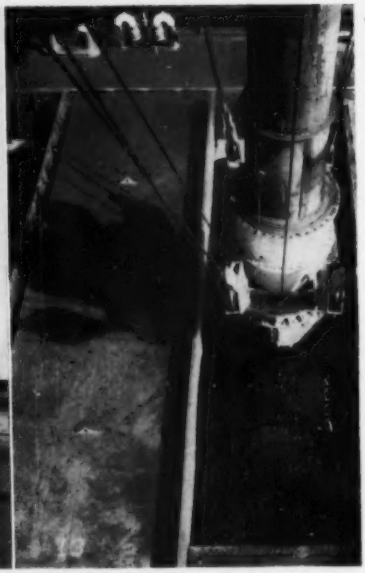
conveyor, is chuted into ship.

POWERFUL MECHANICAL "PIG" shoves two coal cars at a time up the ramp into dumpers' jaws. Moved by cable, the pig rides on its own narrow rails laid between and below railroad tracks.

BRIMMING WITH 70 TONS OF COAL EACH, the two cars enter mammoth dumper mechanism. They push the preceding cars out the other side and onto a spur. [*Please turn the page.*]



GRIPPED AND FLIPPED, cars roll over and pour out their loads onto a conveyor belt. Winch-powered cables clamp jaws over the cars' sides, holding the cars firmly against the track.



COAL SPEWS INTO SHIP'S HOLD from a rotating head that spreads the cargo evenly. The loader operator follows telephoned directions. As a hatch fills up, the head is gradually lifted by

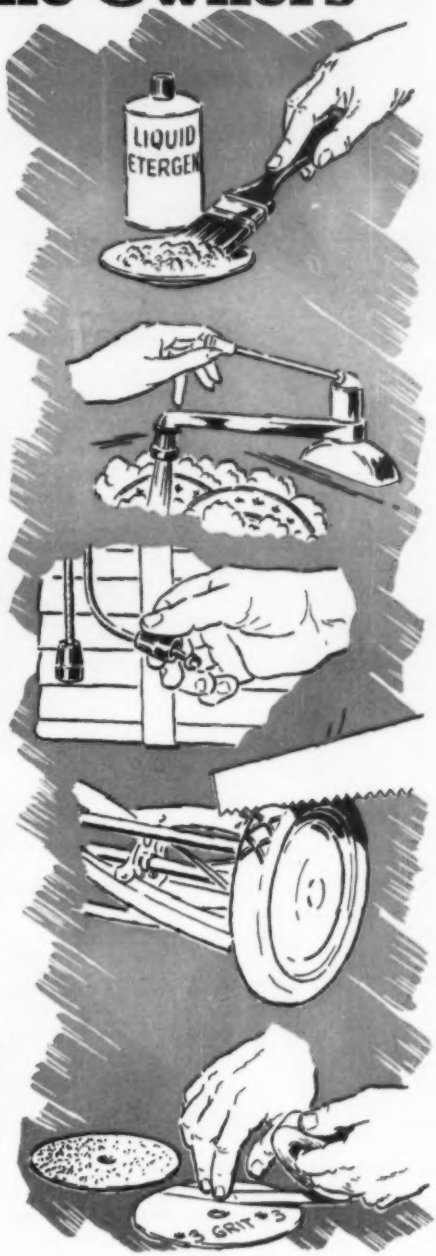
LARGEST CONVEYOR BELT of its kind speeds coal at a 600-feet-per-minute pace to the loading dock. The rubber belt is eight feet wide and can handle 6,000 tons of coal an hour.

telescoping the tubular chute to which it's attached. To position the loading head over each hatch in turn, the whole tower moves on rails. The ship need not be moved for loading. END

FOOD MARKET ON WHEELS. Housewives at Cold Spring, Ky., who wait for this bus aren't going anywhere except shopping at their front doors. It's a rolling grocery store operated by Lawrence Jones, shown announcing specials of the day. The interior resembles a miniature supermarket. A gasoline generator runs refrigerators, meat slicer, lighting.

WATER-JET DREDGE. Two multi-nozzle heads (right) on this British dredge, when submerged, spout water to break up a river bed. At the same time, the jets create a powerful vacuum in a middle pipe that sucks up soil, vegetation and rocks, depositing them at points up to 1,000 feet away.

5 BUDGET SAVERS for Home Owners



1 If fresh out of paintbrush cleaner, try an all-purpose liquid detergent—or even a liquid laundry detergent. Put the brush on a saucer or can lid and pour enough detergent into the bristles to emulsify the paint. Work the liquid into the brush until every bristle is coated, then rinse it under a water tap. You can clean paint rollers the same way.

2 There's less breakage if you protect china and glassware from one natural hazard: the long-stemmed spout on a mixing faucet in the kitchen sink. Cushion it with a rubber crutch tip with the bottom cut out to allow water to flow through.

3 A bedraggled shade pull or cord pull for a Venetian blind can be replaced with the larger size of solderless connector. Just remove the wire spiral, and drill for the size of cord used. If the black finish doesn't please you, give the plastic a coat of colored enamel.

4 Overhauling an old lawn mower? You may find that the tires have hardened and the tread has worn away. You can restore their lost grip and some of their old bounce by cutting grooves across the rubber surface with an old saw.

5 Get longer life from sanding disks by slapping strips of masking tape across the back of each one. This reinforcement will keep a disk from folding and breaking while its abrasive surface is still good.

POLYHEDRAL BOTTOM. Protruding edges on this Higgins aluminum boat run below waterline for half its 52-foot length. They cushion pounding, give it 40-m.p.h. speed carrying 30 passengers.

KINKED POWER POLE. Two crooks in the electric pole at this curve on a newly electrified German railroad let the swaying cars pass safely. There is also room left on the sidewalk for pedestrians.

DOUBLES SPEED OF SOUND. First flight of the Navy's newest all-weather interceptor, the McDonnell F4H, photographed over St. Louis. Powered by two GE J-79 jet engines, of 15,000 pounds' thrust each, it is designed to fly at better than Mach 2—twice the speed of sound.

Snaking Power Wires Through the Walls

By Ralph Treves

WHEN additional wiring is needed in an occupied house, cables can usually be fished through the walls without tearing the house apart. This holds true whether the job involves a new circuit to an upstairs bedroom for an air conditioner, wiring for new ceiling or wall lights, additional outlets in the living room, or appliance wiring in the kitchen.

A fishing tape is the chief tool in the electrician's bag of tricks. Also known as a snake, the tape is used to find an open trail and pull wires inside walls, through floors, and along vertical plumbing lines such as the vent stack.

The tape is a flat-tempered steel wire. It is sold in electrical-supply stores in 50′, 75′ and 100′ coils for $1.65 to $3.70, depending

THE SNAKE IS JIGGLED through any opening—a vent-pipe space often provides an easy path—to get it through the wall. New wiring, attached to the snake, can then be pulled through.

SNAKING TOOLS: Most important is the coil of steel tape—the snake. Short sections of tape in the center of the photo show how the end is bent to form a hook for fishing, an offset hook for catching a second hook, and an eye for pulling wires through. Brace, extension bit and flooring chisel complete the list of necessary tools.

AN OUTSIDE CONDUIT is often the easiest way to carry new wiring to an upper floor. The conduit is usually placed so it enters the upper room behind the new outlet. It drops straight down along the house to the basement where wires can easily be run across joists to the fuse box.

primarily on the length of snake desired.

Another important tool is a long bit extension that will drill through from one floor to another. Extensions come in 12", 18" and 24" lengths with a square chuck at one end for clamping the shank of an auger bit. The other end fits a standard brace. Extensions are available for use with bits in an electric drill.

Using a snake. The coil of tape must be unwound carefully since it tends to lash out when let go. Several bindings of electrical tape placed at different windings of the coil permit release of only the needed length. Also, with the coil intact, it's easier to rotate the snake when manipulating it.

Some tapes come with a knob at the end for use with a special eye for pulling cables, but generally a tight hook must be bent at the end of most tapes. To keep the springy steel from snapping, the end must be tempered before bending. It can be heated over a gas stove.

If the tape must be pushed a long way between beams, a flashlight is helpful. Placed at the far end of the run, a glimmer of light visible at the starting point will indicate a clear passage.

When the tape sticks or won't go around a sharp bend, a second tape pushed into the opposite end may catch it and pull it through. The helper tape should be rotated and moved back and forth until it hooks onto the first tape. It's like threading a needle in the dark, but even that can be done . . . with luck.

If the passage is blocked, the location of the obstruction can be found by sticking a bit of electrical tape on the snake where it enters the wall. Pulled out and held on the outside of the wall, the tip of the snake will tell where the wall must be cut to clear the way.

Planning the path. The first step is to decide on the location of the new fixture or outlet, and make the necessary wall or ceiling opening for it. The next decision is where to connect the new wiring to the power source. If there's a choice in locating the fixture or outlet, it's good strategy to favor a spot that will permit running wires through partition walls where they can be reached from both sides—preferably walls that adjoin a closet or utility room to minimize damage caused by fishing holes. Outside walls can be reached from only one side, and they are often filled with insulation that would hinder the progress of the snake. Also, to minimize trouble overhead, plan a path through the ceiling that will parallel the ceiling joists.

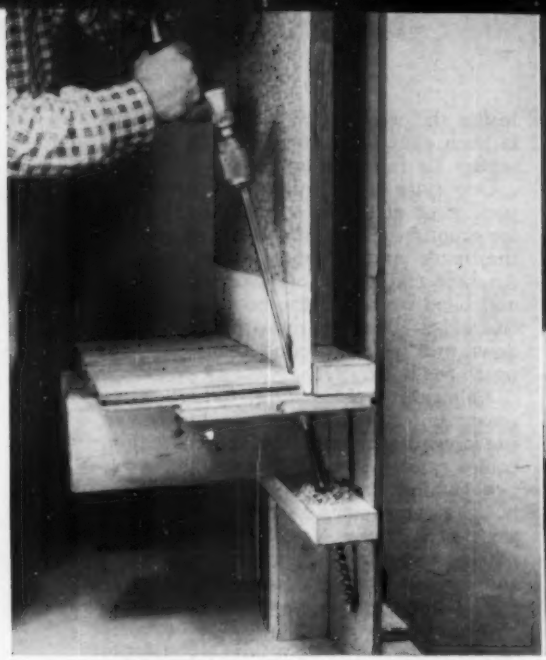
A single utility outlet or fixture can be spliced into the nearest available circuit, but an installation for a kitchen appliance, air conditioner or heavy-duty fan should be carried direct to the fuse box to prevent overloading existing circuits.

Keeping wall damage to a minimum. Holes in the wall are inevitable. A snake seldom will travel a long distance from one point to another without being helped along the way. Punch small holes first and try fishing through them before making larger holes. If the wall is papered, razor slits made in the paper will permit a flap to be sponged loose and peeled back. After the hole is patched, the flap can easily be glued in place to conceal the repair.

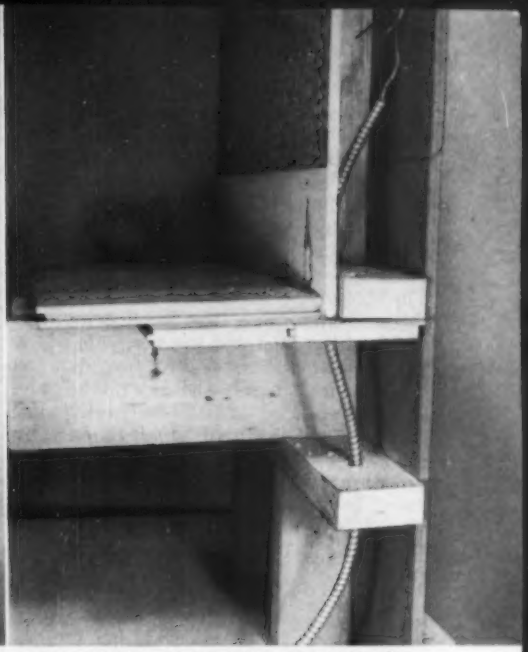
Another way of dealing with holes made for fishing is to install a new outlet in the hole, then continue the wiring to the original location. This method helps simplify the final installation of the wiring by serving as a splice box and permitting the use of shorter lengths.

Ceiling holes are easy to patch. The color is usually white or a light shade that's easy to match.

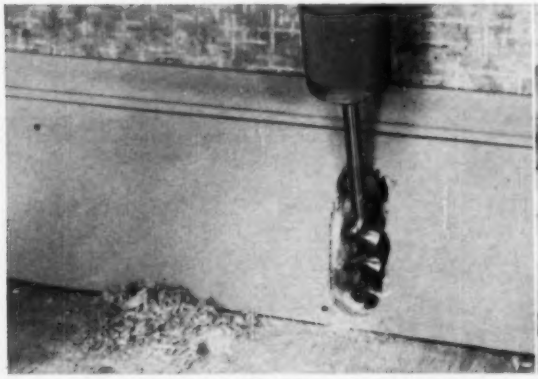
When running a new circuit from the basement to the top of the house, it often may be possible to snake along the vertical vent pipe, working down from a single hole made in the wall of the upstairs



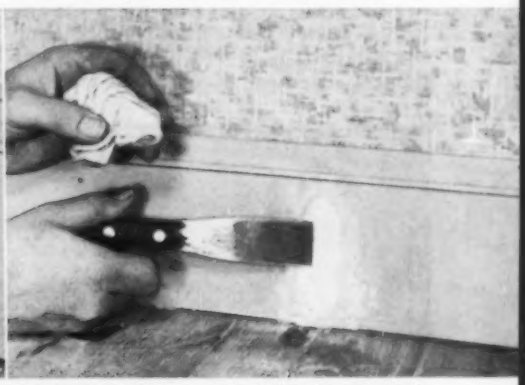
DRILLING HOLES FROM FLOOR TO FLOOR is tricky when both levels are finished. Here the upstairs baseboard is removed and an extension bit is used to drill down into the wall below.



CABLE WOULD BE INSTALLED LIKE THIS after a clear path had been drilled for it. Putting back the baseboard conceals the damage to the wall, making plaster patching unnecessary.



A PAINTED BASEBOARD may be cut into if removing it would cause damage. Breaking away plaster behind the cut gives room to start the bit, and makes it easy to snake the wire upward.



PLASTER PATCH in a wood baseboard can be sanded smooth after it dries—an easy fix for that hole at left. A touch-up of matching paint over the area makes the patch invisible.

bathroom. If this proves impossible, a conduit running outside the house from basement to top floor may save much wall chopping and drilling.

Drilling from floor to floor. In a one-story house, drilling is done upward from the basement, through the subflooring and the two-by-four plate in the wall directly beneath the new outlet opening. Accurate measurements must be taken upstairs and transferred to the basement to avoid having the bit emerge through the flooring.

Drilling from the second floor is more complex as the hole must be started in a finished wall and end up between the

walls. One way is to remove the baseboard on the upper floor and chisel away the plaster to expose the floor plate in line with the proposed outlet below. The bit must be held as near plumb as possible, and by starting the hole in the near edge of the plate the chances of coming out inside the wall below are increased. The bit must travel 12″ to 15″ to go through the plate, the subflooring, the width of the joist and the top plate of the lower wall.

Removing a baseboard may not be easy. It could split or damage the wall paint. It can be cut into with small damage by boring three holes in a vertical line and chiseling away the material between them. Breaking through the plaster behind the cut gains access to the floor plate, and drilling proceeds as outlined above.

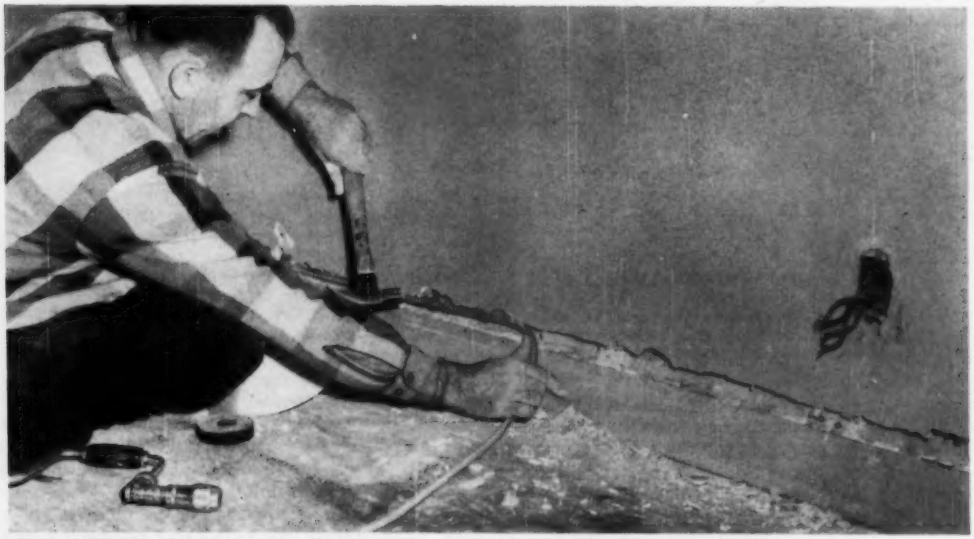
The gash in the baseboard is repaired with plaster after the wiring is installed. When dry, the plaster is sanded smooth (and shaped to blend with the cove molding, if that was cut, too). When painted, the plaster patch will be as smooth and hard as the original wood.

Tying wire to a snake. After successfully coaxing a snake from point to point, the next step is to pull it back, dragging the new cable with it. The frustration of losing the wire midway in the pullback is such that it cannot be printed, so a secure tie is important.

One type of tie calls for stripping an inch or so of the wire and wrapping one leg around the tape, the other leg through the hook and around the other wire. Another method is to separate the wires and bend each into the hook from opposite sides. The wire ends are then bent down and wound around themselves beneath the hook.

Concealing the cables. Where wires must run outside the wall, as when traveling laterally across a stud-filled partition, cables can be concealed in several ways:

- Behind the baseboard. The baseboard is removed and a narrow channel is chiseled into the plaster behind it. Replacing the baseboard covers the wiring and no wall patching is needed.
- Below the baseboard. Here, too, the baseboard is removed and a ⅝″ strip is ripped from the bottom edge. The cable is laid along the floor and the baseboard replaced above it. The gap between baseboard and floor is hidden by a new shoe molding.
- Behind the base molding. Only the cove molding on top of the baseboard is removed and the plaster behind it carefully chiseled out. The cable is set in the groove chopped in the plaster behind it. Replacing the molding conceals groove and cable.



LOOKS MESSY BUT ISN'T: Cove molding on top of the baseboard is removed and cable set in

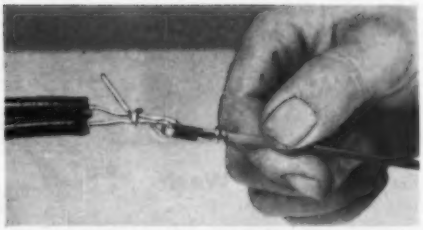
groove and covered by replacing the molding. Caution: Drive nails downward into the baseboard to avoid hitting the wires.

• Weaving in and out of the wall. Usually a last resort because of the patching involved, the cable is threaded in and out of the wall around each stud. The cable is stapled flat against the studs and is plastered over.

Ceiling installations. In a one-story home with an unfinished attic, it is only necessary to bring a cable from a nearby circuit and install the fixture from above. The switch leg is dropped through a hole in the wall plate and fished out at the opening for the wall plate.

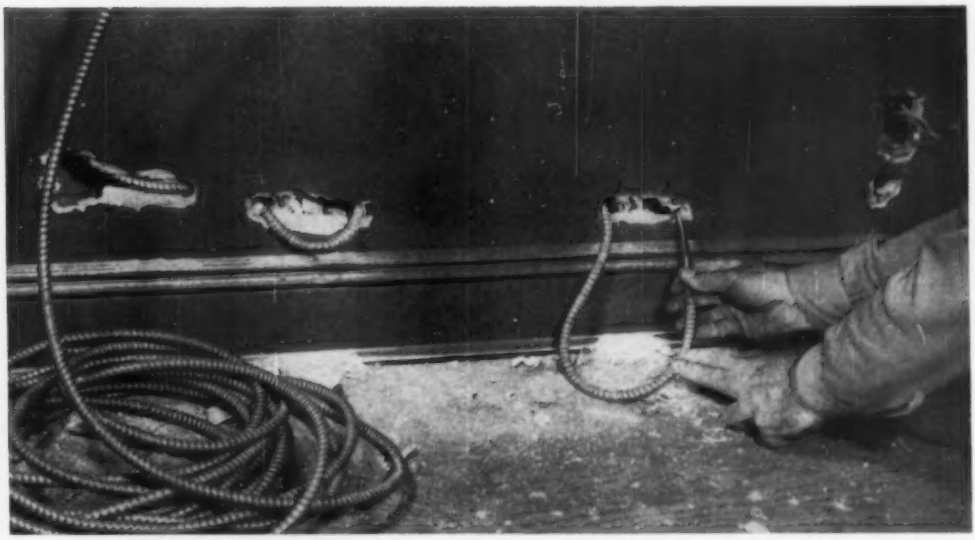
Where the floor above is finished, removing a section of flooring to avoid damage to the ceiling may be worthwhile. A flooring chisel is used to slice into the tongue and groove, and a strip of flooring is lifted. The subfloor beneath it is chiseled or grooved with a portable saw and the cable set in the groove. After connecting the cable to the fixture and dropping the switch leg down into the wall, the strip of finished flooring is nailed back in place to cover both groove and cable.

Wherever possible, it's a good idea to complete the wiring and install the fixture and switches to be sure everything's in order before patching over.



WIRES ARE TIED SECURELY to the eye bent on the end of the snake. To prevent losing the cable on a hard pull around a corner, the tie should be firm but not bulky enough to snag.

SMALL HOLES IN PAPERED WALL can be concealed by sponging loose a strip of the paper and bending it back. After the hole is filled in, paper is glued back in place to cover the patch.



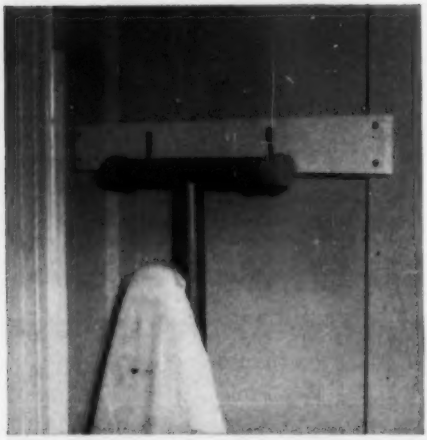
CABLE CAN BE WOVEN IN AND OUT of the wall, through small holes punched on each side of the studs. Studs can be notched to recess the cable, and the holes plastered over. END

Short Cuts and Tips

Getting More Wash on a Clothesline

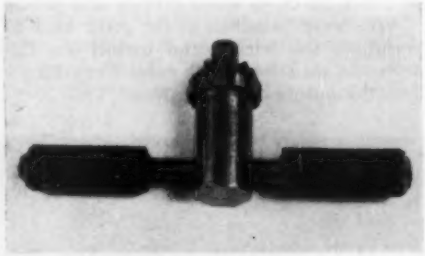
WHEN I have an extra-large wash, I clip small items together with clothespins so they hang in rows. It conserves space on the line and doesn't increase the drying time.—*Sylvia Laskow, Los Angeles.*

▶▶▶BECAUSE I keep box and open-end wrenches in a bag in my car, I painted the eighth sizes yellow; fourths, red; and left the sixteenths unpainted. Now I can pick out any size I want in seconds.—*Charles P. FitzPatrick, Philadelphia.*



Support for Hangers on Door

TO HANG objects such as an ironing board, towel rack or full-length mirror on a door having a recessed panel, you will need a firm support for the hooks. A 3″-wide board screwed to the stiles makes an effective span for the panel.—*Bert Slanhoff, Mt. Vernon, N.Y.*



Rubber Grips for Chuck Key

A DRILL-CHUCK key used continuously through the day soon becomes uncomfortable and hard to hold. I put a length of rubber hose on each side of the T. It improves gripping and prevents slipping when you get oil on your hands or the key.—*Henry J. Greene, Oklahoma City.*

This Mousetrap Catches Fish

I SCREWED a new, clean mousetrap to the end of a 2′ length of plank to make a cleaning board for fish.

Clamped under the spring, the tail is held tight while I scale the fish.—*George J. Berkwitt, NYC.*

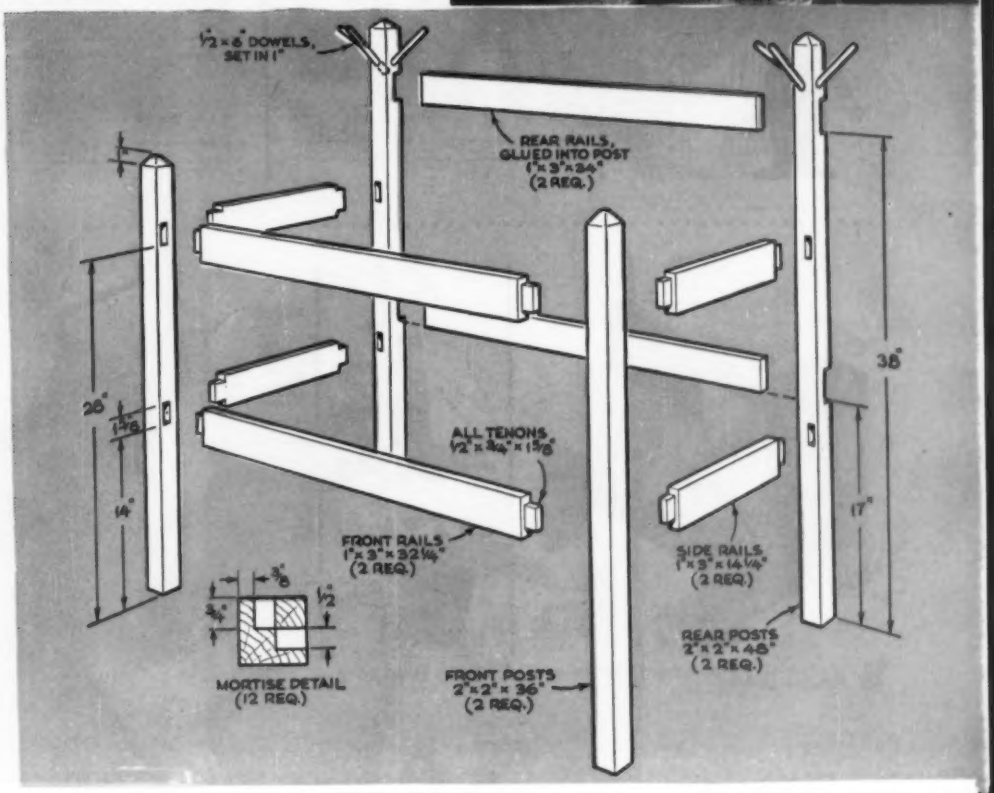
Heigh-o, pardner! Here's how you can build—

A Clothes Corral for a Young Cowpoke

HERE'S a clothes corral that gives pint-sized cowpokes a big kick when they hang up their chaps, gunbelt and sombrero before turning in. It has plenty of room for airing blankets, too.

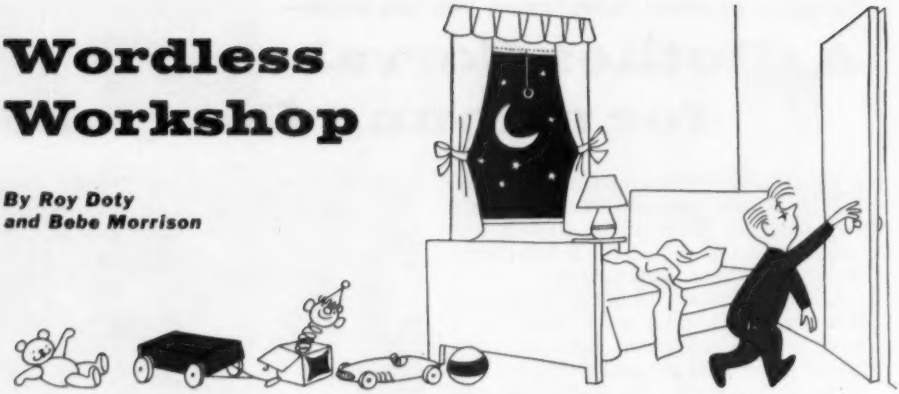
Materials? About 14′ of two-by-two, 17′ of one-by-three, and 3′ of ½″ doweling. I used mortise-and-tenon joints in most places, but you might prefer simpler butt joints with dowels. Or, easier yet, you can screw or bolt rails to the outside of the posts and have them meet in mitered corners.

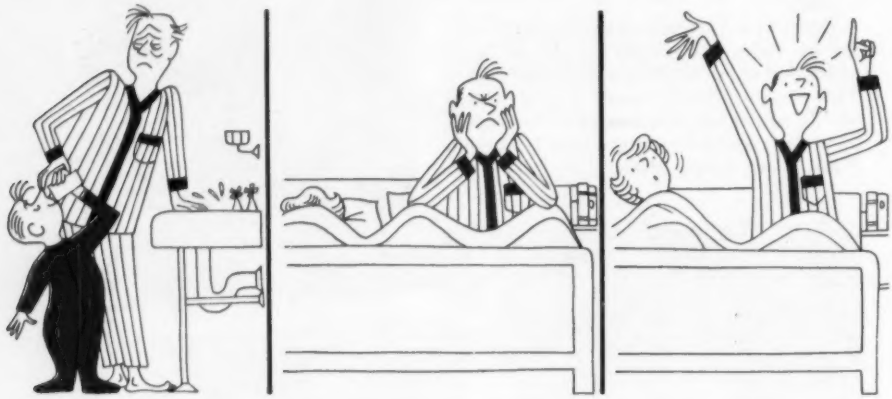
For added Western flavor I gouged into the flat sides of the rails for a hand-hewn effect and smoothed them with sandpaper. The rough-finished wood was branded with a soldering iron and given two coats of clear sealer-lacquer.—*David Farkell, White Bear Lake, Minn.*

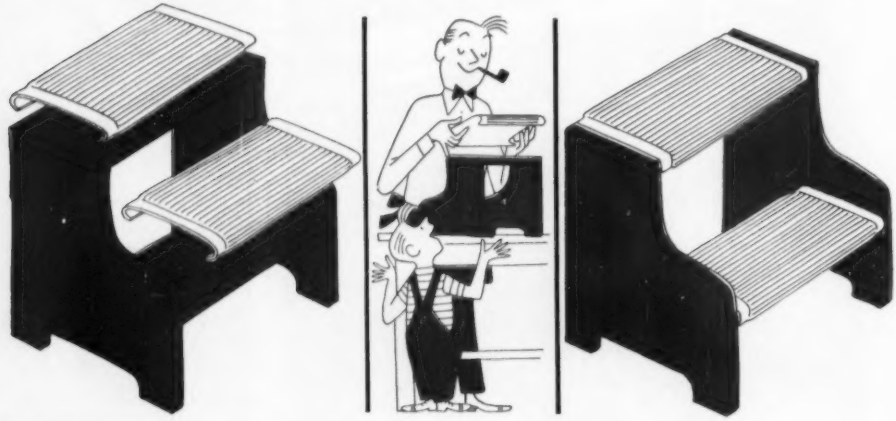


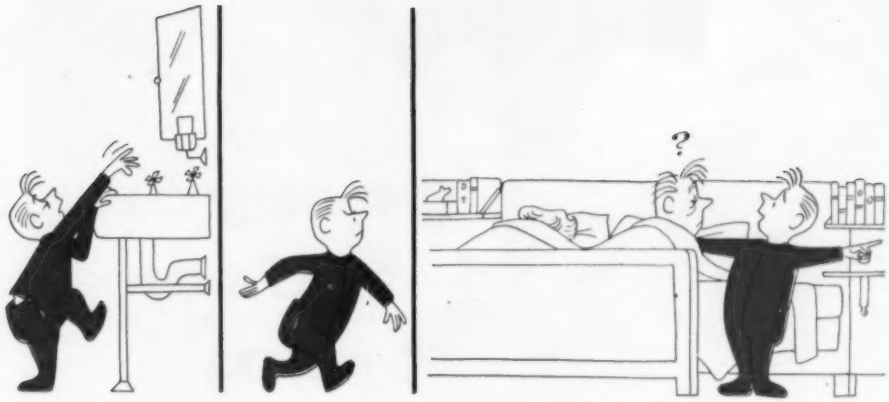
Wordless Workshop

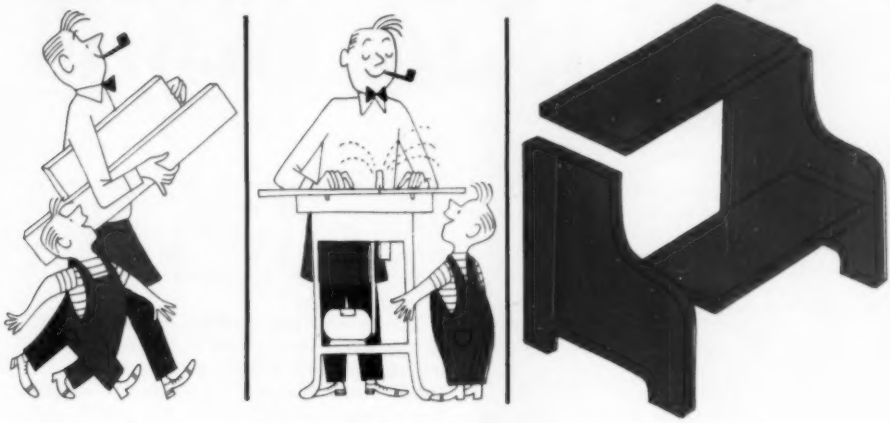
By Roy Doty
and Bebe Morrison

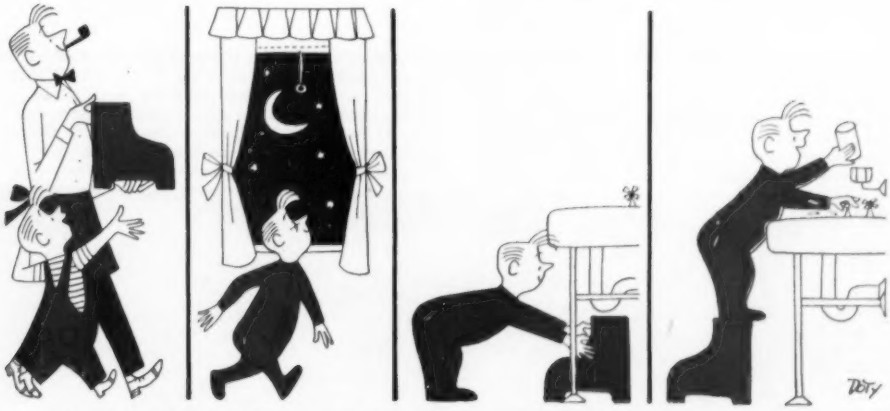












Next Month: A fold-up ramp to roll cargo into a station wagon

Everyday Uses for INERTIA

HAMMER HEAD IS SNUGGED IN PLACE by bringing the handle to an abrupt halt. The loose head continues to move, wedging itself firmly on the shank taper. You use the same trick, but with a reverse twist, to tighten the heads of axes, adzes, mattocks and grub hoes. Here the handle flares out toward the end. After slipping the eye of the head over the back of the handle, you tighten it by striking the end sharply while the tool is pointed down.

JUST about everyone has tightened a hammer head by bringing down the base of the handle on a solid surface. When the handle stops, the head, being loose, continues downward until a snug fit stops it, too.

That's putting inertia to work—one of the many ways you can benefit from the physical property of matter that Sir Isaac Newton made the subject of his first law of motion.

To use inertia as a valuable, everyday helper, you should keep these two im-

DRIVING NAILS IN UNSUPPORTED WORK goes quickly and without risk of damage if you use a heavy backing block. The block will bounce away each time you strike a blow, but not before the hammer has advanced the nail.

FREEING A TWIST-DRILL SECTION broken off flush with the work is often possible with an assist from inertia. Grip the other end of the stock and tap close to the hole. This way you drive the work away from the drill end.

RAPPING A FILE HANDLE sets it in sudden motion. The loose file remains stationary at the moment of impact and the handle forces its way over the tine. Use the same method to tighten the handles on chisels and most types of carving tools.

portant Newtonian observations in mind:

- Abruptly stopping a moving object will let loose parts shoot ahead.
- Abruptly starting a dead-still object will leave loose parts behind.

In each case, the loose parts *tend* to shoot ahead or stay behind even when they can't. With the hammer, the head would fly the full length of the handle and smack your wrist if the shank wasn't shaped to stop it. This means that you can sometimes use inertia to loosen parts as well as tighten them.

MISUSED INERTIA: Whipping a brush downward and then stopping it abruptly clears it of paint and solvent, all right. But it's tough on the bristles, which are fanned out violently by the same force, and may not repoint.

LOOSEN CHUCK from an unclamped lathe spindle this way: Tighten a bolt in the jaws; then apply a wrench to its head and tap the handle lightly. Inertia of the spindle and pulley resists rotation. As a result, the chuck is easily freed.

PARTING TUBING—vacuum-cleaner extensions, for example—is easy with this setup. Clamp blocks on both sides of the outer section and give one block a number of sharp raps with a hammer, striking away from the joint.

Now Outboards Can Be JET-PROPELLED

TWO Californians have worked out an ingenious way to convert any small outboard from propeller to jet propulsion. For $35 to $60, depending on motor size, you buy a device called a Hydro Drive. Made of aluminum and weighing two pounds, it can be substituted for the standard lower unit of an outboard in five minutes.

The Hydro Drive offers the boater two special advantages: It's much safer for carelessly placed fingers and toes than a prop—appreciated by skin divers based on a power boat. And fishermen or duck hunters can fearlessly slither their boats through weed-choked waters.

Propelling a boat forward by shooting a stream of water astern is not new. But previous applications of Newton's Third Law of Motion ("to every action there is an equal and opposite reaction") have been on inboard motorboats. Stanley Griffin and his son Robert, of Costa Mesa, Cal., appear to have the first outboard using this principle.

Their Hydro Drive device comes attached to a two-foot length of driveshaft and is contained in a flat, snail-shaped housing called an involute. Inside is an impeller that whirls at a maximum speed of 5,000 r.p.m., sucking in water through a tough, round-holed screen in the bottom of the housing. The water swirls through a curving tube that's narrow at the inlet, becoming gradually wider toward the exhaust.

When driven by a three-hp. outboard engine at full throttle, the impeller pumps water out the tailpipe at the rate of 40 gallons a minute, developing 19 pounds of static thrust. Even strong swimmers have failed to make headway against this underwater blast; one or two lost their trunks in the attempt.

The Hydro Drive's water jet shoves an eight-to-12-foot boat along nearly as fast as a propellered engine of the same horsepower—on 25 percent less fuel. Oddly, it will move big boats that a propeller-driven outboard of identical horsepower doesn't budge. And the Griffins have demonstrated that their jet drive enables a boat to crawl right up a stiff, foaming current that would overwhelm a comparably powered prop.

True, there is no way to reverse the Griffin Hydro Drive—except to swing the outboard engine around until it faces backward. This is impossible on the stern of an eight-foot dinghy, where it works most efficiently. But the Griffins have devised a neat solution.

Cutting a well in an unconventional craft like a paddleboard or a molded-plastic scooter, they mount in it a jet outboard with steering wheel on top. The engine can be swiveled in any direction; it can even move the scooter sideways.

Griffin Hydro Drive Co., 1990 Harbor Blvd., Costa Mesa, Cal. makes units for three- to 6½-hp. engines.

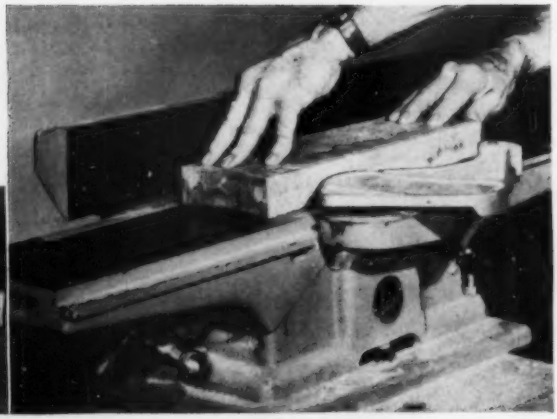
HYDRO DRIVE PARTS include (left to right) the involute or housing, an impeller, the pump cover and a driveshaft with parts of the engine's water-cooling pump attached to it.

SWITCHING TO JET PROPULSION involves little more than removing and replacing four bolts on the lower unit of a regular outboard. The Hydro Drive jet, shown with its inventor, Stanley Griffin, draws from eight to 12 inches less water than a standard outboard propeller.

JET STREAM spurts visibly from a three-hp. motor when it's tilted upward. The stream would work as well in air: Reaction to thrust, not back pressure from the water, propels the boat.

A MODIFIED PADDLEBOARD has its deck partly cut away to form a cockpit and motor well. The craft, designed especially for fishermen, is steered by turning a wheel atop the motor.

Short Cuts and Tips



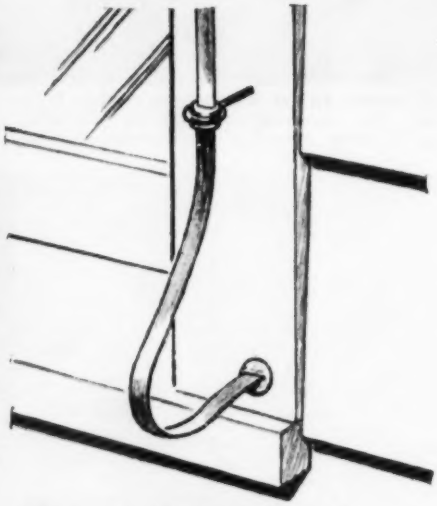
There's a Trick to Planing Crossgrained Hardwoods

You may have discovered that it's almost impossible to surface curly maple or other crossgrained hardwoods on a jointer without chipping half moons in the face. A water treatment helps.

Lay the piece on newspaper and wet the surface with a sponge two or three times. Let it soak about 10 minutes, wipe with a cloth, and plane with a light cut. If another pass is needed, dampen and wipe again. Most of the wet wood cuts away, leaving a smooth surface that will dry quickly and require a minimum of sanding.—*Edwin M. Love, Palmdale, Cal.*

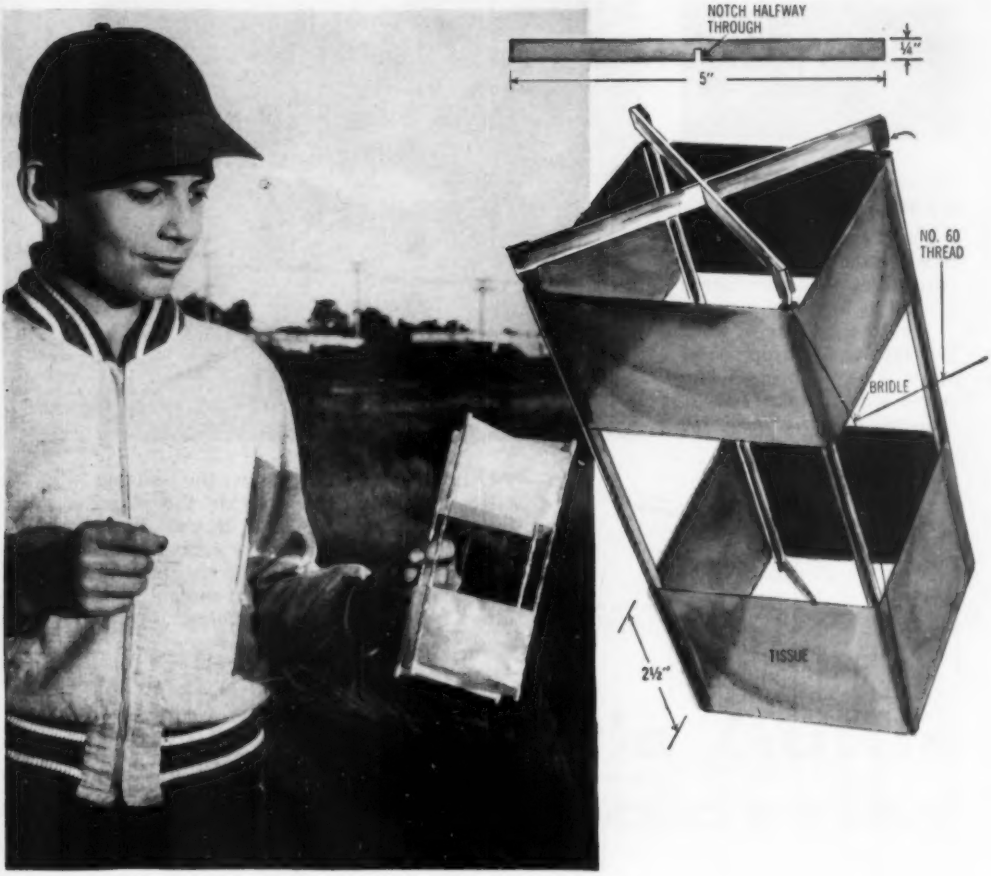
Coping-Saw Scratch Guard

Here's a good way to keep the chucks of a coping saw from marring the finish on a piece that is being sawed. Slice two thin disks off a cork with a razor blade and pierce them in the center. Slip these over the blade and cut with one on each side.—*Bil Toman, Palatine, Ill.*



Tip on Installing TV Lead

An easy and efficient way to feed a TV lead through a window or door frame is to bore a ¾″ hole in a member that doesn't open. After you thread in the lead, putty up the hole and repaint; the lead will appear to be molded right into the wood. —*Hugh M. Gordon, Burlington, Ont.*



Soda Straws Frame Tiny Box Kite

AN IMPULSE is about all you need to build this miniature box kite; there's no elaborate list of materials.

Only 3½" square and the length of a soda straw, it performs in a light breeze with the stability of a kite 10 times its size —and you can fly it on a spool of thread.

Construction consists of razoring four ¼" strips of thin balsa and notching the center of each to make two cross-lapped X frames. Cement balsa tabs to the frame ends and taper the tabs to fit in the ends of four soda straws. If you've a choice, the thin cellophane straws are lighter than the waxed-paper kind. But either will do.

Wrap each end of the soda-straw frame with a 2½"-wide band of tissue and cement the bands in place.

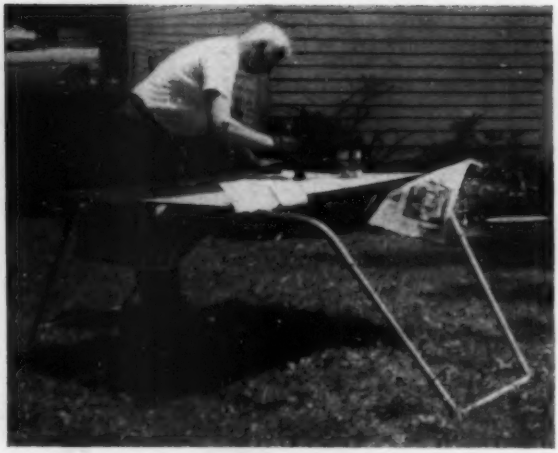
For the bridle, tie a length of thread (No. 60 cotton is strong enough) to the top and bottom of one straw, leaving an inch or two of slack. Then tie the flying thread to the bridle. Any breeze better than three m.p.h. will carry the kite aloft. Lacking a breeze, you can tow it at a brisk walk or slow trot to make it rise. —*Lig Mayhew, Cleveland.*

Short Cuts and Tips

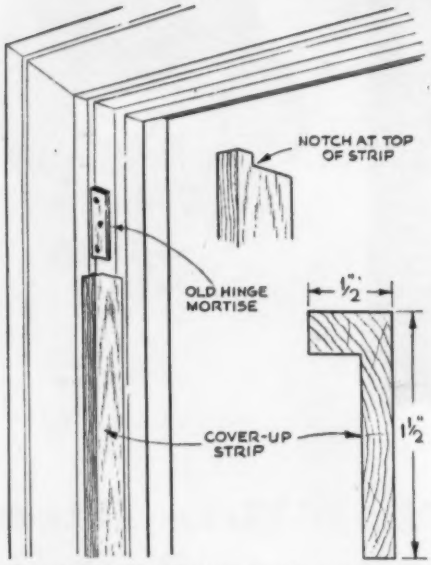
Work Supported by Hammock Frame

I MAKE my portable hammock frame do double duty—it serves me as sawhorses as well as for lounging.

Inverted, it takes work for sawing, painting and other jobs. I protect the metal with papers.—*E. A. Rerucha, Franklin Park, Ill.*



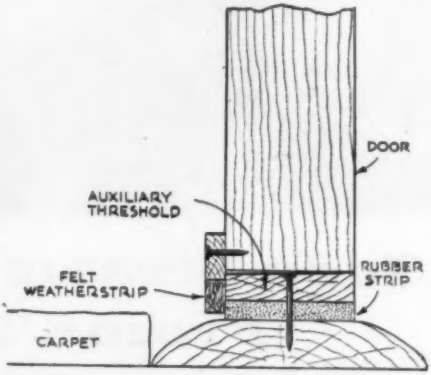
▶▶▶IT'S best to withdraw the cutting edge of a plane blade inside the plane before you store it. But if you don't, at least snap a wide, heavy rubber band around the plane to cover the cutting edge and prevent nicks from contact with other tools.—*Ken Murray, Colon, Mich.*



Cover Strip Dresses Doorway

WHEN you remove a door in an old house to make a modern cased opening, you can hide the hinge and latch mortises with an L-shaped cap mold that you can saw out from lengths of ½"-by-1½" stock.

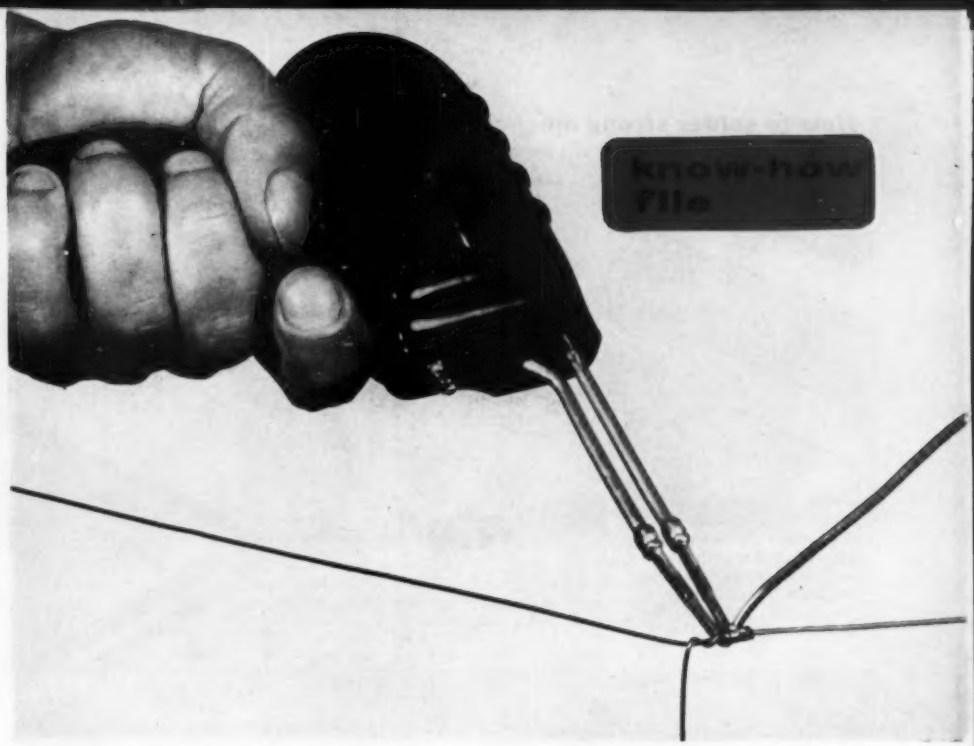
The strip must be measured for each job to assure a good fit. Nail up with 1" brads, sinking the heads and covering with wood filler. When it's finished to match the rest of the trim, no one will suspect that a door had been hung in the opening.—*Harold Jackson, Kankakee, Ill.*



Weatherstripping a Short Door

WHEN we installed wall-to-wall carpet in our living room, the high tufting interfered with opening the front door. So we cut ¼" off the bottom of the door.

Then to get a tight weather seal, I made an auxiliary threshold of this strip, tapering it to allow the door to start in the opening and nailing it to the original threshold over a length of rubber. The squeezed fit is snug even without the felt weatherstripping I used for added insurance.—*Morris Roth, Duncan, Okla.*



A Beginner's Guide to Soldering

THERE'S nothing mysterious about soft soldering. Your savvy starts when you understand how a mixture of tin and lead bonds other metals. It isn't a fusing process like brazing or welding. Instead, chemistry does the trick. At a temperature well below the melting point of the work, the solder *dissolves* a small amount of the surface metal and blends with it.

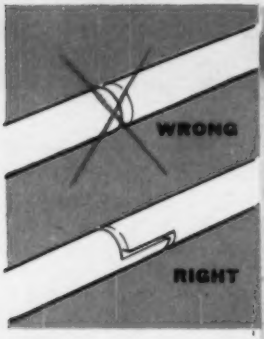
This solvent action can't take place unless you:

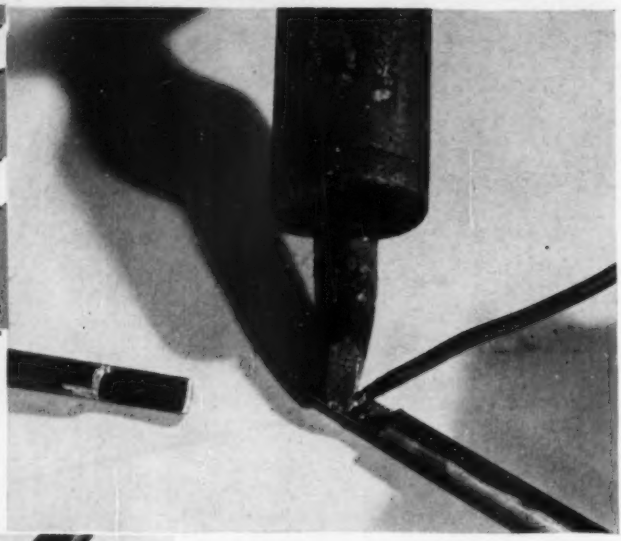
- Clean the metal. All traces of insulation, paint, grease, rust, oxidation or other nonmetallic coatings must be cut, filed, wire-brushed or sanded off.
- Apply heat to the metal—not directly to the solder. For a good blend the work must be as hot as the molten tin and lead. It will be when the iron or torch has raised its temperature enough to make the solder flow.
- Use flux. The moment you apply soldering heat to the work, a new oxide starts to form. The purpose of the flux is to float it off and hold it in suspension until the solder melts and the surface metal is dissolved.

Gun, iron or torch? In general, a gun is handiest in close quarters. It also offers you the convenience of almost instant heat, and the safety and economy of automatic shut-off when you release the trigger.

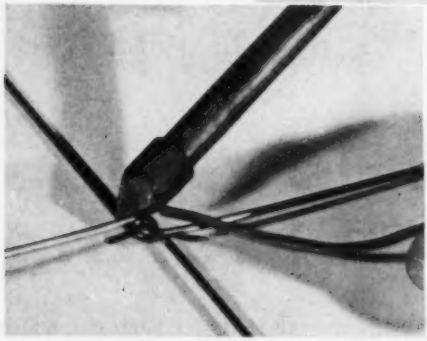
For most household repairs and sheet-metal projects, you'll make out fine with a conventional soldering iron (150 watts or more). Torches, particularly the ones that use pressurized gas, are good for the big jobs—sealing pipe joints and stopping

How to solder strong mechanical joints





WHEN JOINING ROD or heavy wire, an overlapping joint (above) tinned and sweated together will be nearly as strong as the rod itself. Plain butt joint (top) will break under even the slightest strain.



WRAP WIRE AROUND ITSELF and join it with a blob of solder. A wire form assembled in this way will have less tendency to break apart than one made of four separate pieces.

leaks in gutters, repairing or applying flashing.

What kind of solder? Soft solder is manufactured in thousands of alloy proportions, shapes and sizes. The alloys you'll find most useful contain from 40 to 60 percent tin. Whenever the ratio is specified by some such symbol as 40/60, 50/50 or 60/40, the first number refers to the tin and the second to the lead. The 40/60 variety is the least expensive, and works well for most purposes. However, alloys having a higher tin content make somewhat stronger bonds.

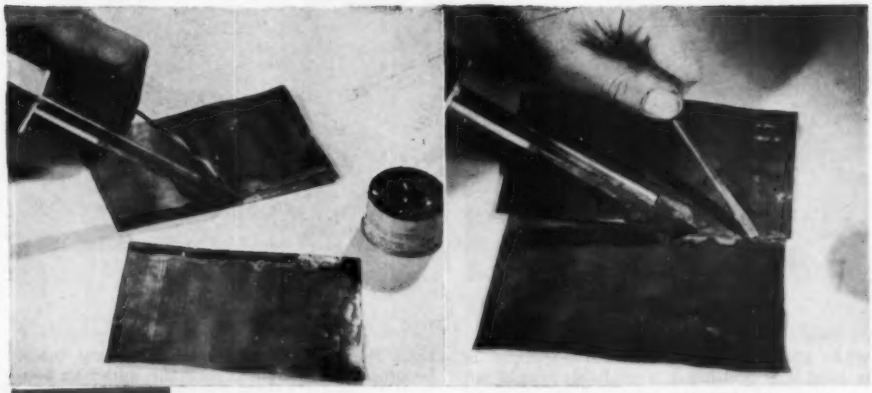
Economical one-pound bars are good for large torch and melting-pot operations, but you'll find wire solder much easier to handle in the tight spots. You can buy it either solid or with a flux core. The former costs less, but you still need flux. The latter is tubular, with just enough flux inside to keep surfaces clean while the solder blends with them. Both wire types come in a wide range of diameters, or gauges. Select the size in relation to the job—overloading a joint won't increase its strength.

One more product worth considering is soldering compound. Here, finely powdered tin and lead are suspended in a heavy flux. This silvery-gray paste is generally used to join parts that can't be reached with an iron or gun. Applied to a small wire splice or terminal connection, it can be melted with the heat of a match. It's also handy for soldering one flat surface to another. You simply trowel it on the mating areas, press them together and apply heat.

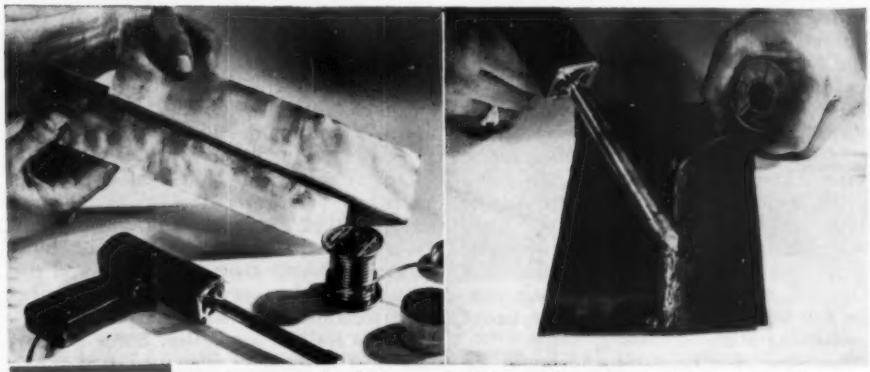
A word of caution, though. The heavy tin-lead dust settles rapidly to the bottom of the flux. Stir the compound each time you use it.

Choosing the right flux. Whether you buy flux separately, or use flux-core solder or soldering compound, you have

Two ways to join sheet metal



SIMPLE OVERLAPPING JOINT is adequate for most sheet-metal jobs. Cut the pieces large enough to overlap about a half-inch, and carefully sandpaper the meeting surfaces. Apply flux and coat each edge with solder, then join or clamp them and run a hot iron along the joint, flowing in more solder if needed.



CRIMPED JOINT should be used when metal is subjected to stress or vibration. Allow enough extra metal to fold over the meeting edges and bring them together as at left. Flow solder into the folds, preferably on both sides for maximum strength. Besides being extra strong, this joint stiffens the metal.

a choice of three basic types. These are *chloride* (usually called "acid" type), *organic* and *resin*.

Never use anything but resin flux for electrical connections. Unlike the other two types, it's completely noncorrosive after cooling. Chloride is your best bet when you're working with large chunks of metal and must pour on the heat for some minutes to bring it to solder-melting temperature. Its residue is highly corrosive, however, and should be removed with vigorous hot-water scrubbing after joints have set.

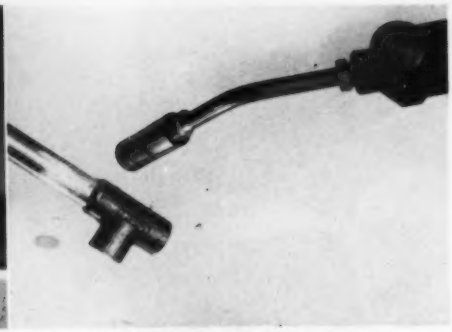
Organic flux is a good choice for run-of-the-mill soldering. It won't hold up under heat as long as chloride, but its dry and withered residue is not nearly so corrosive, and can be brushed or rubbed off easily.

During soldering, both the chloride and organic types are much more active than resin, with chloride slightly out in front. This means they'll set the stage for stronger joints when you're soldering difficult ferrous metals.

How to tin an iron or gun. Metal surfaces to be soldered must be free from

A torch is best for sweat joints

SWEAT JOINTS require a different technique. If the joint was pretinned, it probably would not fit together, so clean the tube and the inside of the fitting, apply flux and assemble the parts.



Heat the joint with a torch until the metal becomes hot enough to melt the solder on contact. Continue heating until the solder flows smoothly into and fills the entire joint.

oxide. The same goes for the working end of an iron. A new one often has a thin coating of solder on each face of its tip. Without this "tinning," oxide builds up rapidly on the hot copper, preventing heat transmission.

If an iron hasn't been tinned, or needs retinning (they all do at frequent intervals if they're used much), plug in the juice. Then file each of the tip faces until it's clean and shiny. Wait until the copper starts to darken from the heat, then rub flux-coated or -cored solder lightly but thoroughly across each face. Wipe off the excess with a cloth pad. Use the same technique to tin the tip of a soldering gun.

Applying the heat. Heat should be carried to the solder by way of the work surfaces. The only exceptions are when you've already bonded the alloy to the metal and want to build up a fillet or level out a dent. Then you can apply additional solder directly with the tip.

A common beginner's mistake is using the point of the iron like a pencil. This way, little heat is transmitted to the work. Lay the flat, or flats, of the tip firmly against the metal surfaces and ease along slowly enough to melt the trailing or parallel solder. If you're new at this, practice on a couple of strips of tin-can stock, the easiest of all metals to join. With the right timing, you'll be surprised at how evenly the solder levels itself as it becomes molten.

When soldering wire, apply heat to the underside, touching the solder to the top. Then roll the tip slightly upward on both sides to catch and level any unsightly beads.

In all soldering, when you see too much molten alloy building up, wipe it off quickly with a rag. That's easier than filing or sanding the abrasive-clogging excess away after it sets.

Torch soldering. Here you work with higher temperatures that cause all but chloride-type fluxes to break down rapidly. Adjust the valve for a clear blue flame no longer than necessary, and direct it slightly away from the soldering area to hold oxidation down.

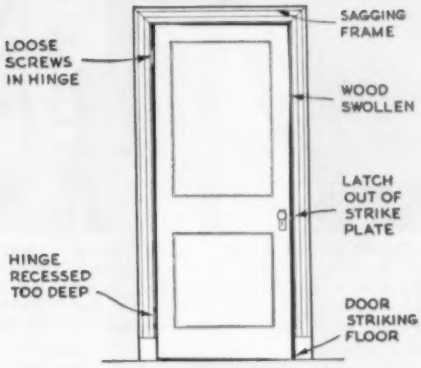
Don't let the work slip. Some soldering may make you wish you had three hands—one to grip the metal parts, either directly or with pliers or a hold-down, another to apply the solder, and the third to handle the heating tool. Clamps often solve this problem, but when you use ones made of metal, insulate their jaws with little pads of wood to prevent heat carry-off. You can learn to hold both wire solder and an iron in one hand, maneuvering them like chopsticks. Again, wire solder can be cut to lengths and laid along a seam.

How you manage is not nearly as important as preventing a slip just before the solder sets. When this happens it will turn gray. That's bad—a sure sign that the joint will be weak. If this happens, run your iron, gun or torch back over the metal and try again.

Door Repairs 1

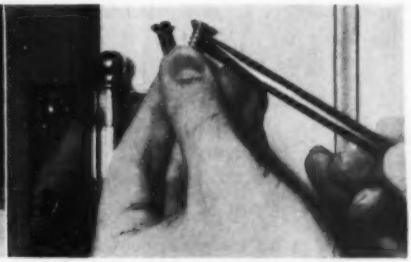
fix-it file

STICKING DOORS or doors that won't stay closed result from many things: loose or poorly set hinges, screws loose in wood, house settling and forcing jamb out of square, wood swollen from moisture or shrunk from dry heat. Carefully check all alignment factors before you plane off wood that may have to be glued back on door edges later. Planing is the last resort, when other methods fail to work.



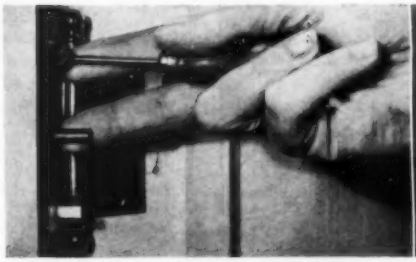
How to tighten hinges

BEFORE TIGHTENING LOOSE HINGES, prop up the bottom of the door with a wedge to take the strain off the screws. Otherwise, the weight of the door may cause the screws to strip the holes when tightened.

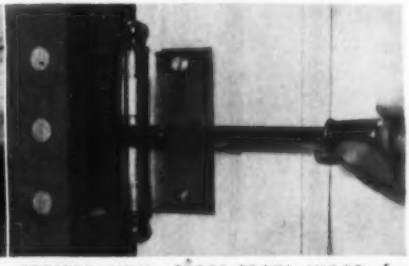


IF SCREWS CAN'T BE TIGHTENED, try longer ones of the same diameter, or use sheet-metal screws, which are threaded along the entire shank. If thicker screws are used, enlarge the hinge holes for their heads.

How to reset screws

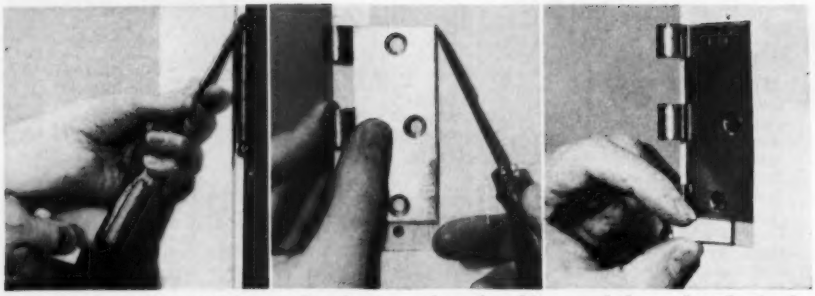


WHERE HOLES ARE HOPELESSLY STRIPPED, remove screws and tamp in steel wool or wood putty, or force in fiber screw anchors or glue-coated wood plugs. Wait until glue or wood putty sets before driving in screws.



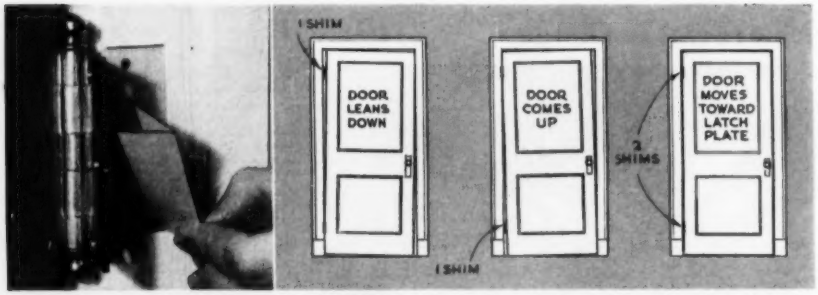
PROVIDE NEW, CROSS-GRAIN WOOD for screws to grip by drilling into door in line with screws but at right angles, and gluing dowels in holes. Trim dowel ends flush with door and sand smooth; then reset screws.

How to reset hinges



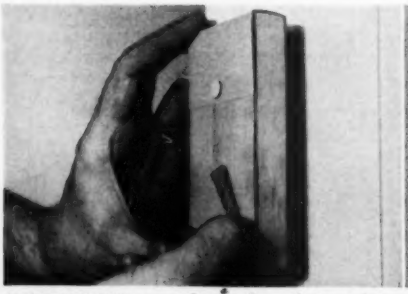
IF PATCHING WON'T WORK, your best bet is to shift the hinges to give the screws a fresh start in new wood. Most hinge pins can be tapped out with a hammer to separate the two halves. Shift the hinge leaf enough to clear the old screw holes and scribe in the area to be chiseled away. After enlarging the hinge gain to the new position, fill in the gap below the hinge with a thin sliver of wood. Glue it in place and sand flush.

How to adjust hinges

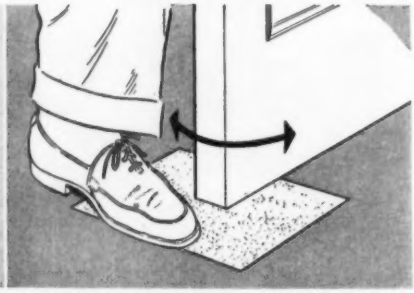


SOMETIMES A BIT OF PAPER folded in half may be the answer to a door problem. Remove the hinge screws and cut the paper to fit the gain. Use two or more sheets if necessary to make a shim of the required thickness. Remember that a shim placed under the lower hinge will lift the door upward; placed in the top hinge it will move the door outward and down. Shims under both hinges may help a latch to reach the strike plate.

How to sand dragging high spots



LIGHT SANDING may free a door that catches only on small high spots. Sandpaper tacked to a wood block as shown will cut down high spots on the jamb without removing wood or paint from inside edges of stop strips.



IF DOOR RUBS THRESHOLD when closed, or if it scrapes the floor when fully opened, place a sheet of coarse sandpaper on the floor, hold it with one foot and work the door over it until it no longer makes contact.

materials file

Contact Cement

the adhesive that's stuck on itself

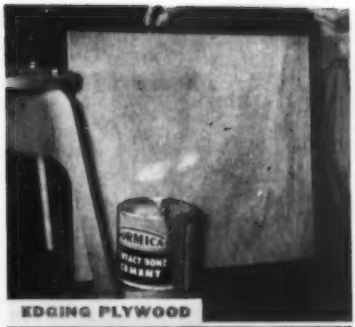
CONTACT cement was developed for sticking down counter tops, and it is widely used to put up plywood panels without nails. But even though you may not be planning to tackle either of these projects, contact cement has a place on your utility shelf.

The beauty of this many-purpose, quick-grab adhesive is that it will stick almost anything to anything—and without the benefit of clamps. But don't use it in place of wood glue where a maximum-strength bond is called for. It's not that strong. And don't use it like ordinary glue. It must dry before you put the joint together.

Contact cement is synthetic rubber and resins in a volatile solvent. When the solvent evaporates, a pressure-sensitive adhesive is created. But it's the kind that will stick well only to itself. Touch two such surfaces together and they will grab instantly. Other things, however, won't readily stick to a dry film of contact cement.

Basic technique of contact adhesion is simple enough. Spread the cement on both surfaces. Give it 30 minutes to dry. Then press the surfaces accurately and firmly together. That's all you need to know to do an acceptable job in most situations.

The surfaces you can bond with contact cement may be almost any material you're likely to work with around the home or shop—including many on which no other adhesive is worth beans. It works well on wood and plywood,


EDGING PLYWOOD

APPLYING SANDING DISKS

MITERING CORNERS

PUTTING UP WALL TILE

4 of the many jobs you can do

hardboard and wallboard, plaster and concrete, cardboard and felt, rubber and leather (both real and artificial), and other porous materials.

It handles such hard-to-glue things as metal and glass (mirrors, too), plastic, neoprene and glass-fiber laminates.

All areas to be joined must be clean and dry. If they are metal or other non-porous surfaces, use sandpaper to roughen them up if you can do it without damage to the work. Clean with a solvent such as lacquer thinner and wipe dry.

Be sure that the materials are not cold. Both the cement and the surfaces should be at ordinary room temperature —around 70 degrees—if you want the best bond.

How to apply it. Spread the cement with a notched trowel if you're covering a large surface. Contact cement works best when applied heavily, and a notched applicator puts on just the right amount.

Several makers offer applicators to go with their adhesive. It's best to put an unusually heavy coat on porous surfaces where some will sink in. To do this, hold the applicator so the teeth are at a right angle to the surface. This is a good idea with softwood (including plywood), untempered hardboard and most kinds of wallboard.

How many coats? How thick the coats of cement should be and how many of them, depends on the materials—how porous or absorbent they are. If you are resticking the ivory veneer to a piano key, for instance, one coat is enough. To join a felt base to the porcelain base of a lamp or vase, each will take three or four coats. The same holds true for the end grain of softwood. Use at least two coats on *any* vertical surfaces. For fastening a metal plaque or monogram to a flat metal, glass or plastic surface, one coat will do.

Remember to allow at least 30 minutes' drying time for *each* coat, but anything up to two hours is perfectly safe. When you put the two surfaces together, they should be tacky but not wet. Test them by lightly pressing a bit of wrapping paper against the surfaces. The paper should come away without lifting any of the cement.

Join the surfaces accurately the first time. The virtue of contact cement is its quick and positive grab—and this means you can't move the parts once they touch. For putting a loose tile back in place this poses no problem. With large surfaces you can do the positioning with wrapping paper in between. In repairing rainware and storm boots, accuracy is not too important. Some jobs, however, such as mending or re-covering luggage or books, call for meticulous matching before you bring any two surfaces into contact. Still, even if you botch a job, all is not lost.

Trouble shooting. If you have misjoined surfaces or want to break a joint for some other reason, use a solvent. This can be either lacquer thinner or the solvent sold by the maker of the cement.

Sometimes you can apply the solvent with a small brush. A more efficient method is to squirt it from an oil can run along the joint, peeling back the material as you go.

If you fail to get a good bond in some areas, or there are indications that the joint isn't bonding as it should, you may have let the cement become *too* dry. Here the remedy is less drastic. You can reactivate the cement with heat. Use a heat lamp or an ordinary light bulb—never flame. Warm the area, then press the two materials together. Hold or weight them until they have cooled. Note: With most cements, this must be done within the first three days.

To clean applicators or brushes, use the same thinner or solvent suggested for breaking joints. Turpentine, kerosene and gasoline won't touch contact cement. And keep the stuff and its solvent off painted and varnished surfaces and asphalt tile. It will soften and mar them just as lacquer will.

When working with contact cement take all the care that you would in using lacquers and cleaning fluids. It is inflammable. Work in a well-ventilated area and don't breathe the fumes for prolonged periods. Keep the can tightly closed when you are not using it.

Contact cement is put out under half a dozen or so brand names. Which one you get at the store doesn't matter much. They are all about the same, do the same jobs, are applied the same way.

Use the adhesive with care. Use it right. It will do a hundred jobs you'd never thought possible before, and it will lighten the work of many familiar ones.

3 ways to apply contact cement

USE A NOTCHED TROWEL or special applicator to cover large areas with right amount of cement. Hold it with teeth 45 degrees to a nonporous surface, 90 degrees to a porous one. You can make a spreader by cutting about seven notches to the inch on one edge of a 6" sheet-metal square.

A PAINTBRUSH is a good all-around applicator, as in this job of repairing loose weatherstripping. As in all cases, be sure both surfaces are clean and dry. Sandpaper the wood to remove any old glue or paint. Lay the cement on instead of brushing back and forth.

WOODEN PADDLE is handy for spreading contact cement over small areas or in places hard to get at, like this repair job on a loose corner. This homemade paddle has sawtooth notches in the end. It can also be used in much the same way as a trowel.

5 Tips on Using Contact Cement

USE A ROLLING PIN to bond large areas that are flat. Put plenty of weight on it as you roll. It's best to complete the bonding as soon as the two surfaces have been joined, while the cement is still fresh. But you can let the cement dry and reactivate it with heat within several days.

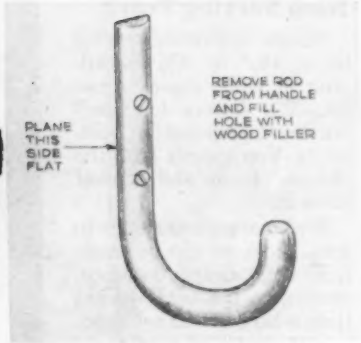
SLIP SHEETS OF WRAPPING PAPER are a great help in exactly positioning large surfaces. With the cement set, put the parts in place with the paper in between. Slip out the paper to give contact along approximately 2" of the end. Press firmly. Then pull out the rest of the paper.

DOWELS OR CLEAN STICKS can be used to hold surfaces apart when joining them. This method is particularly useful when repairing a corner like this one that has come loose. For large-scale laminating, it's best to work from one end, removing the dowels one at a time.

SMALL ROLLER will bond most small work and irregular surfaces, and is fine for the edges of large areas. Any roller not more than 3" wide will do. Safest rule is to use both roller and hammer-and-block method on any areas that are difficult or call for a very firm bond.

HAMMER-AND-BLOCK TECHNIQUE may be used anywhere. It is especially good for bonding narrow edging jobs. Hold the small block of softwood and tap it gently. Then move it along and hit it with the hammer until you have covered every inch.

Short Cuts and Tips



Handle from Discarded Umbrella Hangs Clothing on Wall

AN OLD umbrella handle may be used to make an effective wall hanger for coats and a hat. Plane or rasp the side away from the hook so it will fit flat against the wall and drill for two wood screws. You need not paint the piece—umbrella handles usually have a fine finish that blends with woodwork.—*Frank Shore, NYC.*

Copy Holder for Typist

WITH a 10″-by-16″ sheet of galvanized iron you can make a handy holder for a typist's copy. Bend a 4″ or 5″ rest on the long side. You will find a small alnico button magnet is strong enough to hold four or five thicknesses of paper. —*H. J. Gerber, Stillwater, Okla.*

How to Anchor a Screw

WOOD screws sometimes shake loose when the board into which they are driven is subjected to a great deal of vibration. You can lock them in place by drilling a small angled hole in the head and putting in a brad or small finishing nail.—*R. J. De Cristoforo, Los Altos Hills, Cal.*

Short Cuts and Tips

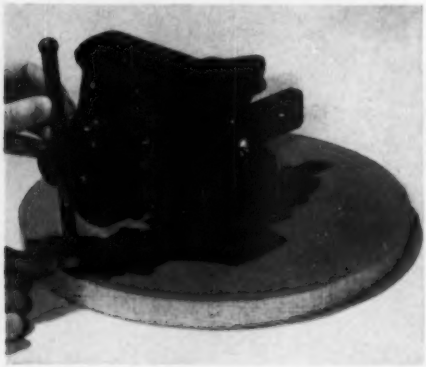
Picture Frames from Serving Trays

THOSE individual serving trays, 4¾" by 6¾", available in dime stores make excellent frames for small portraits, snapshots or postcards. You simply trim the pictures to fit and cement them in.

Wall hangers or stands to prop them on can be made from stiff cardboard and cemented to the back, or cut from a tin can and soldered. —*Arthur Trauffer, Council Bluffs, Iowa.*

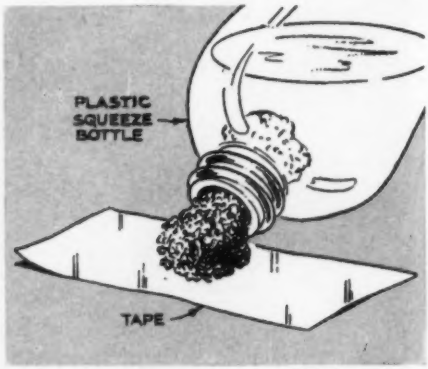
▶▶▶AN ICE cube inside a plastic vegetable bag will slow down the development of shadow areas in a print. Dip it into the solution and pass it over the darkening portions slowly. Don't move the tray or agitate.—*Ken Murray, Colon, Mich.*

▶▶▶AFTER experimenting and asking around, I put shingle stain on the outside of the concrete foundation blocks in my house. The color remains virtually unchanged after several years and has received compliments.—*Robert Tyson, NYC.*



Portable Mount for Bench Vise

EVER wish you had a bench vise when working in another room in the house or in another part of the shop? You can make a light vise portable by mounting it on a sturdy wood or plywood disk. A blind hole near the rim will hold the screw handle while the vise is being carried.—*Frank A. Javor, Newark, N.J.*



Dampening Gummed Tape

IF YOU don't like licking adhesive on tape, remove the top from a plastic squeeze bottle, fill with water, and stuff the neck with a cellulose or rubber sponge. Turn the bottle up, let the sponge soak, and you're in business. If it needs more water than it normally feeds—just squeeze.—*Carl H. Betz, Philadelphia.*

How to Make a Batting Tee

SHORT of a pitching machine, there's nothing that will give a budding batter the feel of the strike zone better than a batting tee.

The tee positions the ball where only a red-hot pitcher can put it, giving the boy a square crack at it every time, and eliminating the danger of wild pitches.

Tees are simply 3/4" pipe topped off with 1" radiator hose. Extend the hose at least 8" above the pipe to allow it to flex when hit and to take the sting out of low swings. Use different pipe lengths to vary the ball height within the strike zone between the boy's knees and his shoulders. Three tees with overall heights of 22", 30" and 38" make a good all-around set.

Cut home plate from 3/4" plywood and mount it on a broad plywood base. Drill 12 $1\frac{1}{16}$" holes in the plate for positioning the tee close to the batter or near the "outside" zone. Using these holes in combination with the three tee heights makes it possible to place the ball in 36 different strike positions.

In bad weather, the tee can be placed in front of an old blanket hung from the basement joists to stop the ball. Weight the base with a bucket of sand to keep it from sliding on the smooth floor.—*R. Mathiot, Lake Grove, Ore.*

The Case for Buying an Older House

Chosen wisely, it offers more per dollar than a new house. Latest FHA rules make buying easier

By John L. Springer

TODAY, shoppers are going for secondhand houses at a rate unequalled since the '30s. In such representative cities as Los Angeles, Detroit, Houston, Atlanta, Denver and San Francisco, sales were up 300 percent in 1958.

Much of the boom results from the big assist given this market by the Federal Housing Administration. Formerly many families had to buy new homes because they couldn't make the down payments needed for old ones. Now, thanks to a broadened FHA base, low initial payments and interest rates apply to all acceptable houses regardless of age.

This points up the question: How good a value is the older dwelling? The best, say the experts, provided you choose wisely. Consider these advantages:

You get more space for your money. As FHA Commissioner Norman P. Mason puts it: "Today's buyer wants a bigger package. His family is larger, and the current trend is to make the home the center of more and more activities."

Dozens of surveys bear him out. Most modern young couples want at least three bedrooms, two baths, a spacious kitchen and a family room. Few, however, can afford a new house with these features.

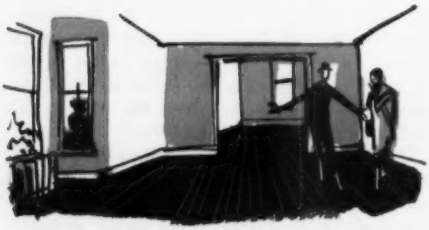
The used house often solves the problem. Brokers in many areas report that if you're willing to settle for a 25-year-old, you'll get at least twice as much floor space for your dollar.

Your home is ready to be lived in. After being swept off his feet by a set of blueprints or a sample house in a new development, the impulse buyer is often shocked at the many "extras" he needs.

The used property generally offers these improvements. Of course you'll have to replace and repair some items. But a survey by the Allied Home Owners' Association of Roslyn, N.Y., indicates that you'll still come out ahead. New-house buyers, it revealed, spend an average of $250 a year for inside and outside improvements, plus $85 for repairs—a total of $335. Used-house buyers, on the other hand, spend $150 annually for repairs, but a negligible amount for improvements.

Taxes are more likely to be stable. In older communities there's often no room for further large-scale building. The needed roads are in; established schools and fire and police protection are adequate. In a new tract, community

Any good secondhand house gives you four bonuses missing with



IT HAS MORE AND BIGGER ROOMS. Labor and materials cost much less when it was built.

VALUABLE IMPROVEMENTS ARE "THROWN IN." A lawn, trees, fencing, etc., are new-house extras.

improvements can boost taxes so high that home owners may be kept broke paying them.

You don't buy a pig in a poke. It's easy to close your eyes to the possible shortcomings of a new house smelling beguilingly of fresh plaster, paint and wood shavings. If a dwelling has been up a few years, however, its structural defects are obvious. You can go from basement to attic and note the condition of the foundation, walls, ceilings, roofing, plumbing and heating plant.

This holds for the neighborhood as

most new ones. They're as important as the purchase price

THE NEIGHBORHOOD IS SETTLED. Services are established; land values and taxes are stable.

UPDATING'S EASIER. A smaller mortgage leaves cash for gradual replacement of old equipment.

well. Before you buy an older house, you'll see what's on the next block, where the bus line runs, and how far you'll be from schools, churches and shops. You'll be able to tell whether the street is noisy or quiet, and know if the neighborhood is on the upgrade or the skids.

On the other hand, new homes are often built in open areas. A developer may snatch up the remainder of that vacant land and cover it with low-price houses that reduce the value of the better properties sharply. Or a new home may give you a vista of distant hills; then suddenly the view is ripped apart for an unsightly business or industrial setup.

You may get a better-built home. While experts argue this point, many prewar houses were probably built more carefully than modern ones. Wages were less than half what they are now, and workers were given more time for details. Because the cost of materials was also lower, a higher percentage of the older structures were built with better lumber.

You're in a good bargaining position. Real-estate brokers agree that the owner of an older house will almost always come down in his price. There are two reasons: 1) He is usually anxious to unload for some special reason and will nibble at a cut-rate offer; 2) Because inflation has pushed the prices of all houses upward in the past 15 years, he can probably sell at a few thousand under his asking price and still profit. The new-house builder doesn't have this bargaining leeway, because he rarely stands to make more than a 10- or 15-percent profit above actual construction costs.

Updating possibilities. Many a handyman has latched onto a run-down bargain, moved in, and repaired and modernized it—then resold at a substantial profit. More important to the average buyer, however, is the fact that it's sometimes easier to keep a used house up to date than a new one. When you buy the latter you expect (or may be forced) to stay with all of its equipment for many years. But advances in home facilities are being made so fast that what's modern today is almost certain to be old hat in 10 years.

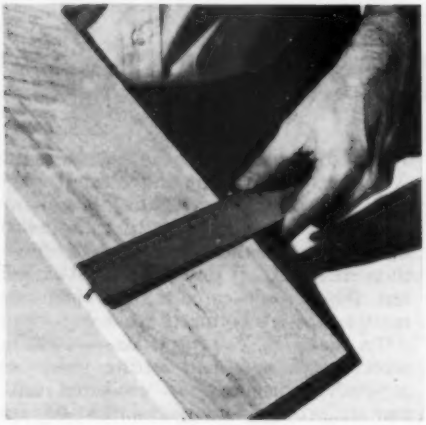
The pitfalls to avoid. Admittedly, buying a used house has its risks. Unless you're a real judge of construction you should never sign on the dotted line without first having the property gone over by a trained appraiser. For about $25 he will go from cellar to attic, looking for sagging floor joists, out-of-line doors, hidden water marks and other signs that may indicate serious defects. It's also important to get his opinion if you intend to go in for extensive remodeling. Some old houses are built in such a way that they can't be modernized economically.

Finally, avoid buying into a rapidly declining neighborhood. Beware when big, old surrounding houses are being turned into apartments or rooming places, or stores or small factories are moving in. Unkept lawns and shabby house maintenance are other warning signs. No matter how attractive an individual property may be, its value will nosedive under these conditions. END

The Easy Way to Paper a Ceiling

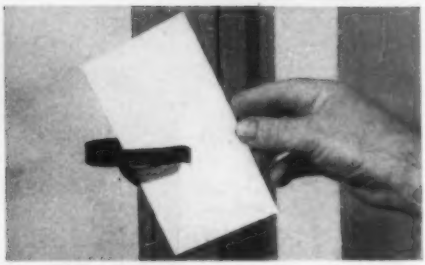
YOU can paper a ceiling like a pro with this British invention. Two crutch-tipped dowel rods jammed between floor and ceiling support a paper-holding tray. As the paperhanger brushes on the paper, the tray is moved by pulling down the upper dowel to depress a spring.

Short Cuts and Tips



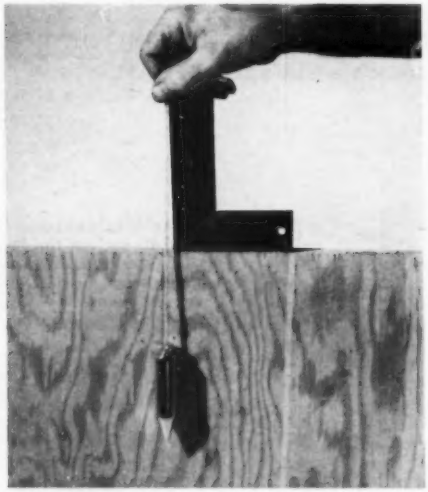
Curtain Hook Backstops Ruler

MEASURING stock is faster and more accurate with an end stop on a wooden shop ruler. The stop is an L-hook, of the kind that is used to hold up curtain rods. Drill a pilot hole for the hook first to avoid splitting the wood.



Letter Holder Reminds of Mail

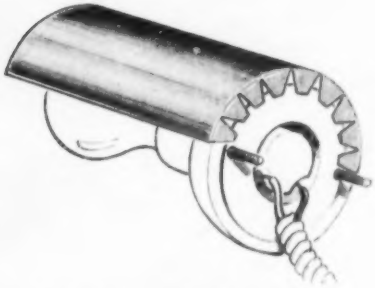
DO YOU often write letters, then forget to take them out to a mail box? Try this. Slip one of a pair of cyclist trouser-leg clips behind the front door frame and use it to hold letters. You'll surely see it when going out.—*Ken Murray, Colon, Mich.*



Improvised Carpenter's Level

YOU can level work with a square and a plumb line if the proper tool isn't handy. Set the square, blade upward, on the piece to be leveled and hang a plumb line from the blade's topmost outside corner. The piece will be level when the plumb line and the blade edge are exactly parallel to each other.

▶▶▶WHEN I can't get hold of exactly the right size faucet washer, I grind down an oversized fiber one. I cut the head off a nail that fits the washer hole tightly, chuck the nail in a drill and grind the washer on tacked-down sandpaper.—*James Miller, Muskogee, Okla.*



Tin Can Makes Light Shade

TIN cans make handy shades for outside wall lights of the kind mounted on porcelain bases. Find a can of slightly larger diameter than the porcelain receptacle. Then trim it and insert it between socket and light bulb, as shown. Tighten the receptacle and paint the shade.—*R. B. Layton, Jackson, Miss.*

The Box That Won't

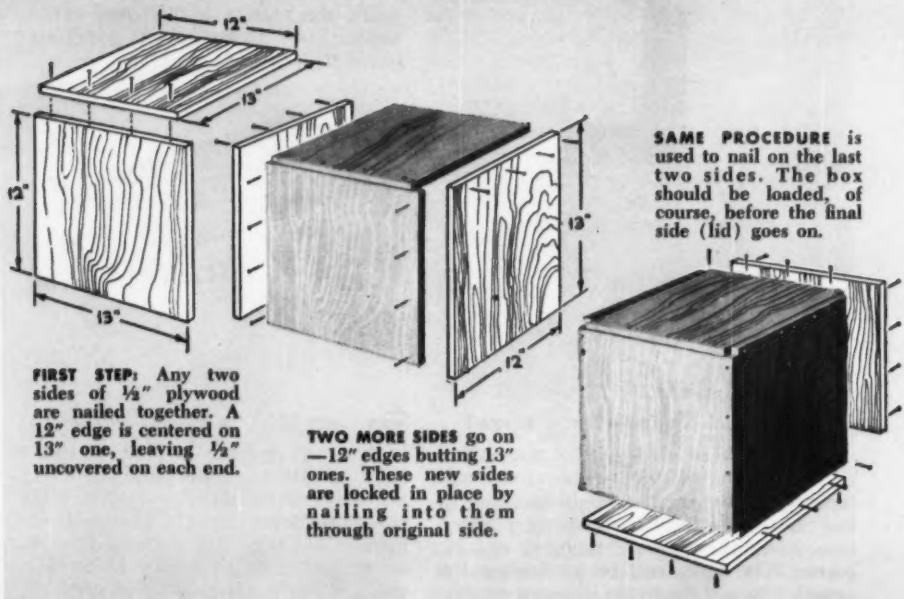
FOR SHIPPING you can't beat a box like this one. Its lap joints interlock. Each set of nails holds one side down and helps brace an adjoining side. All six sides are the same size.

YOU should know the secrets of this box. Nail it together and it stays that way. The weight of its contents never pulls it apart. Ship things in it with complete assurance that it will *all* get there if any of it does; for the box will not (because it cannot) pop open—no matter how it's bounced around.

To make it, you need no screws, no steel braces or finger-cutting straps or expensive corners—just good old nails and six properly cut pieces of wood, one for each side. Nothing else. Plywood is probably best, but any wood will do.

The secret is in the nailing procedure. This is a vicious circle that goes, side by side, right around the box's six sides (or five, it it's a lidless variety). Each nail works two ways—vertically and sideways. The nails that hold any side *on* also hold the nail-onto side *in*.

Building a one-cubic-foot box shows what's involved



FIRST STEP: Any two sides of ½" plywood are nailed together. A 12" edge is centered on 13" one, leaving ½" uncovered on each end.

TWO MORE SIDES go on —12" edges butting 13" ones. These new sides are locked in place by nailing into them through original side.

SAME PROCEDURE is used to nail on the last two sides. The box should be loaded, of course, before the final side (lid) goes on.

Come Apart

By L. R. Sandes

How's that again? Well, maybe you'd better pore over the accompanying drawings to see just what it is that we are talking about.

What's it good for? Lots of things. For one, it's unsurpassed for mailing gifts and goodies that you want to give perfect protection.

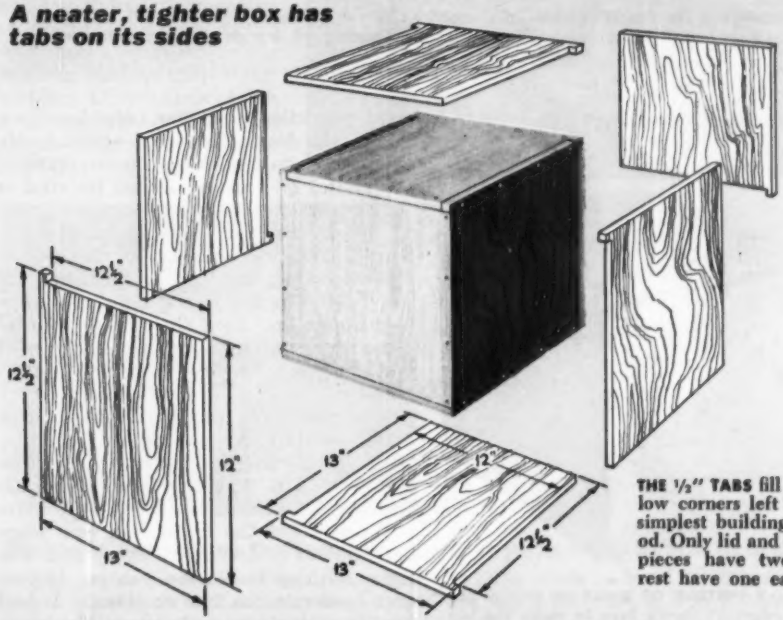
Send that boy who is overseas a box from home that will contain everything when it reaches him that it did when you sent it—for a change. I know; I've been there. It's a long way across the Atlantic, and longer still across the Pacific; and it's not difficult to imagine the amount of punishment any container is subjected to in either direction.

Hunters will find the box useful for storing ammunition from season to season. It would also come in handy for packaging small, easily lost household items and workshop tools for that cross-country, or even cross-town, move. For camping you want a container that will *contain* your essentials until you decide otherwise. This is it.

A cube shape is best for two reasons—economy and strength. Excluding curved-wall containers such as barrels and spherical water tanks, you get more cubic space inside for the same amount of containing surface if the container is an equilateral cube, than you do from any other shape of box. Due to the interlocking design, greatest over-all hold-together tightness is obtained if all 12 edges are of nearly equal length, for then the strain is equalized on all six sides.

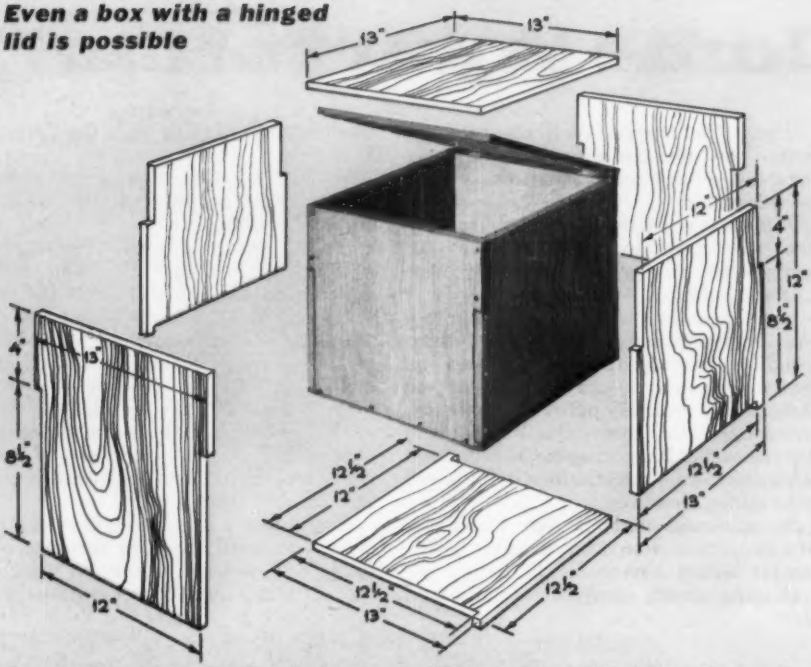
Sometimes a cube is impractical, however. You would not, for instance, want to ship a typewriter in one. In such cases the container should be built to fit its

A neater, tighter box has tabs on its sides



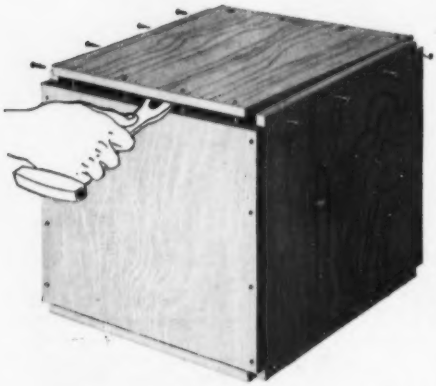
THE ½" TABS fill in hollow corners left by the simplest building method. Only lid and bottom pieces have two tabs, rest have one each.

Even a box with a hinged lid is possible



BY MODIFYING THE DESIGN slightly, the same construction principles can be used to make a lidless or hinged-lid box like this. It makes a sturdy tool, toy or clothing container.

Screws make box easy to open



USE SCREWS INSTEAD OF NAILS on two of the opposite edges as shown here to make the box easy to open. With the two rows of screws removed, it's simple to pry up the edge.

load regardless of other considerations. The same design, however, would apply even to a flattened box for a portable typewriter or a neatly folded fur coat or man's suit.

Any size will do, but the smaller the better. And the bigger you make it, if it must be big, the heavier should be the wood. Half-inch plywood does well for a box up to one foot square; any larger dimensions and this thickness of plywood will have too much spring in it to be reliable.

It really works, too. I built eight boxes a few months ago and shipped my personal effects in them from an Aleutian island to Los Angeles. The 4,000-mile trip took two months.

When I got the boxes, not one seam had split or pulled apart, every nail was tight, nothing inside was broken. Papers and books weren't even damp—I had kept the tolerances quite close. The boxes couldn't have had a fairer test. END

Short Cuts and Tips

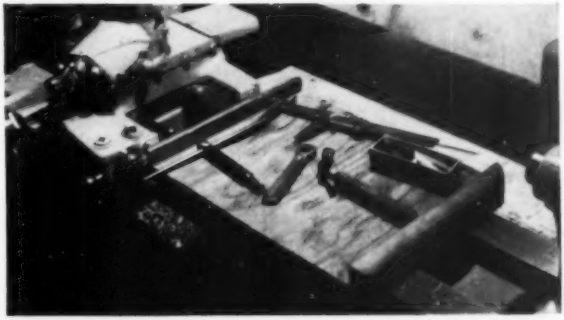
Hose Grips Fishing Pole

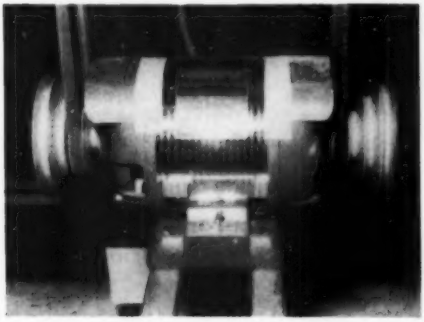
SHORT pieces cut from auto-radiator hose will bundle together sections of a bamboo fishing pole for easy toting and storage.

You need just slit the pieces of hose lengthwise and slip them around the sections of fishing pole.—*Norman Jackson, Milwaukee.*

Sliding Tool Tray Protects Lathe

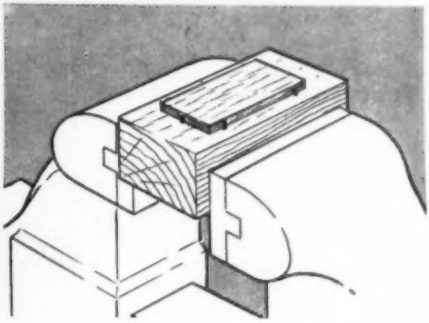
KEEP lathe ways free of nicks by parking your tools on a plywood tray. Screw a wood strip under the center of the tray to fit between the ways and keep it from sliding off. Nail quarter-round molding at two ends of the tray—or all around the edges—to fence in the tools. —*R. E. Platt, Feastville, Pa.*





Motor Wears Dust Deflectors

Two small pieces of sheet aluminum cut to size, bent and secured to a shop motor with strips of masking tape will keep sawdust from plugging the housing vents.—*William F. Hughes, Helena, Mont.*



Gripping Thin Stock in a Vise

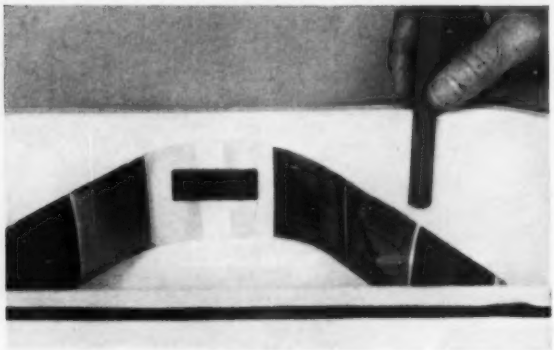
THIN stock is hard to grip in a vise, but not if you mount it firmly on a wood block. You can do this with small headless nails driven in close to the sides. —*Federico Strasser, Santiago, Chile.*

Short Cuts and Tips

Fire Deflector Protects Building

THIS water-curtain attachment was developed by firemen of Harrisonville, Mo., to keep flames from leaping from one building to another.

It was cut from ½" boiler plate and connected to the hose nozzle. There it deflects the stream, forming a fan-shaped curtain.—*Don Hoffman, Kansas City, Mo.*



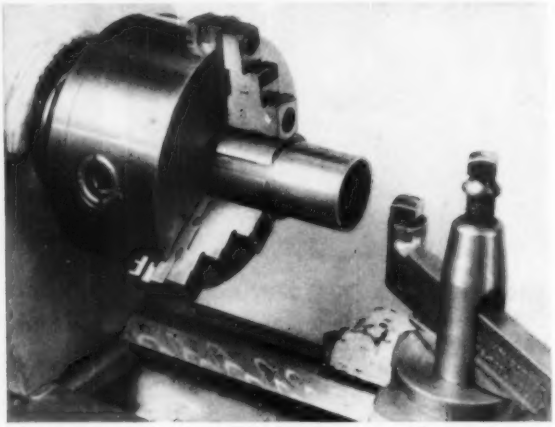
Magnets Make Film Washing Easy

A CONVENIENT way to wash roll film is to clamp the ends to the side of the tray with a small, powerful alnico magnet. This keeps the frames separated for quick washing free from scratches. If you have a quantity to wash, try this scheme in a bathtub; it allows space for stretching the rolls full length.—*O. A. Nelson, Seattle, Wash.*

Sleeve Holds Tubing in Lathe

THIN-WALL tubing is hard to chuck for machining in a lathe because of the danger of distortion or crushing. An effective method is with a length of seamless steel tubing used as a sleeve.

Select a piece that will slip over the work and slit it lengthwise so it can be squeezed. It need not be a close fit; even if considerably larger, it will close accurately if a large enough slot is cut.—*H. J. Gerber, Stillwater, Okla.*



Empty Boat Tows Water Skier

Pulling on the tow lines steers it. Orders through a plastic air hose start it and stop it

By Wesley S. Griswold

ONE of the cleverest pleasure boats in the U. S. carries no passengers. It's a fast-moving midget outboard, piloted remotely by a water skier who rides 35 feet astern from a towline.

Called Ski Horse, the 200-lb. craft measures only seven feet long and 3½ feet wide. A 20-hp. outboard motor supplies enough power to haul a skier around at speeds up to 25 m.p.h.

Lee S. Simpson of Fresno, Cal., developed the unmanned outboard so he could water-ski without depending on his wife to crew the family speedboat. The 38-year-old inventor launches Ski Horse (it takes only a few minutes) and pilots it without help.

A pull on the starter handle fires the engine in its hatch-covered well. Shoving the boat away from him to straighten out the control lines, Simpson covers a little hole in the tow handle with his thumb. The Ski Horse shifts into gear, revs up and takes off. It runs at full throttle as long as that hole remains covered. If the hole is uncovered, as it would be after a spill, the motor idles down and shifts into neutral.

"You steer the boat just the way you

would drive a horse," explains Simpson, a staff supervisor for Pacific Telephone & Telegraph Co. It responds to the tow ropes far faster than a sensitive nag reacts to a tug on the reins.

The tow lines are clipped to the ends of a single rope that runs over sheaves in the stern and makes several turns around a vertical drum atop the rudder post. Stops prevent the rudder from swinging more than 30 degrees right or left. A spring pulls the rudder back to straight-ahead position when the skier is not actively steering.

Most ingenious feature of the boat is the system of pneumatic controls that shift the gears and operate the throttle. As the diagram shows, a little exhaust gas bled from the engine is stored under pressure in a tank. A relatively high-pressure line fed by the tank does the actual work. A similar low-pressure line, terminating at the hole in the tow handle, exercises control.

When the skier covers the hole with his thumb, air pressure quickly builds up in the control line. This opens a relay valve, putting the high-pressure air to work.

High-pressure air is valved first to the piston that shifts gears, then to the piston that opens the throttle. Thus gears are shifted before the engine speeds up. Less than a minute after the skier blocks the air hole, the craft snorts away full tilt.

Uncovering the air hole drops pressure in the control line, closing the relay valve. Now pressure is vented from the pistons in reverse order—first the throttle piston idles the engine, then the gearshift piston puts it into neutral.

The Ski Horse meanwhile slides to a full stop in just a few feet. As its inventor says, "It waits right there for the driver to recover the reins."

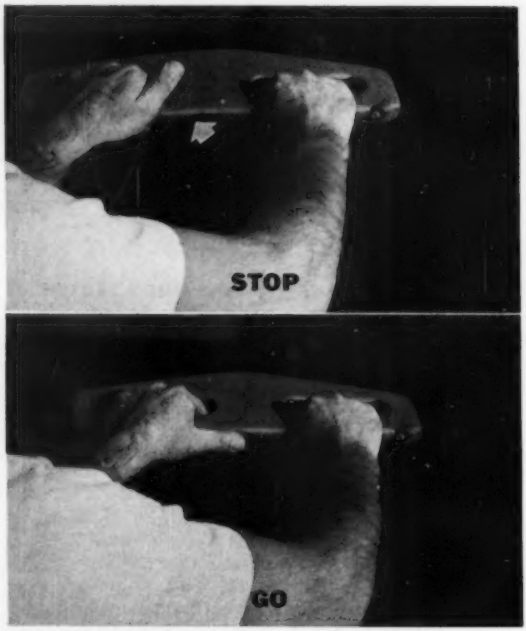
Would Ski Horse run wild if a kink trapped air in the plastic hose to the tow board? This has never happened in hundreds of trial runs. Simpson doesn't think it ever will and shows why. Disconnecting the plastic tubing from the boat, he pinches it double and blows air through despite the restriction.

However, to make control absolutely certain, he suggests one of two safety devices. The first, described in his patent application, would switch off the engine whenever excessive water pressure builds up against a pick-up arm under the boat. This would happen at once, of course, if the Ski Horse ran off at full throttle without a load. A second device would ground the ignition whenever the engine developed excessive r.p.m.

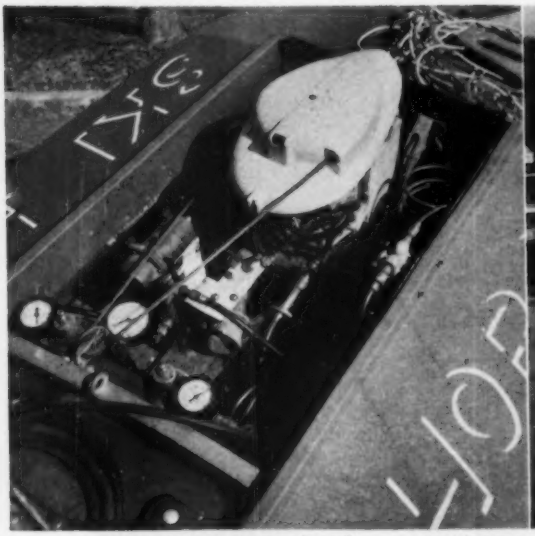
Within two days of conceiving the idea for Ski Horse, Simpson started work on the plans. A natural mechanic, he had no trouble building the control system. Designing the hull was a gamble, but the boat handled perfectly from the start. It leaps right out of the water when crossing another boat's wake at full speed, but it has always landed safely.

The hull is of ¼-inch plywood, and Simpson formed the hatch of fiber-glass, with a bulge in it to make room for the outboard power head. He reinforced the hull bottom with a layer of fiber-glass. Ski Horse, minus the motor, cost less than $100 to build.

Though he's willing to sell the patent rights, Simpson has no intention of manufacturing Ski Horses. He is, however, working up a set of build-it-yourself plans for the boat. They will sell for $15.

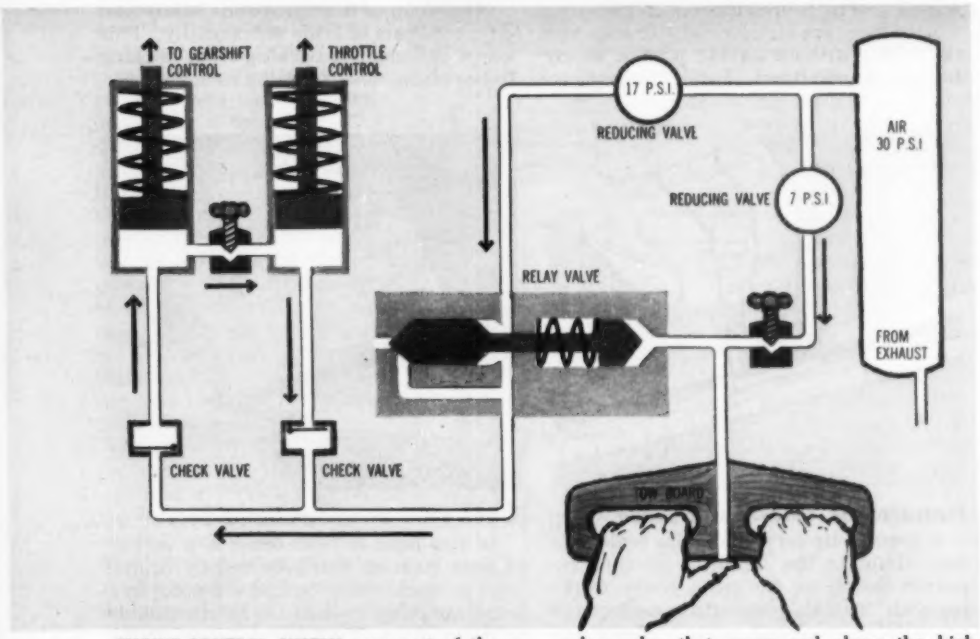


GEARSHIFT AND THROTTLE are controlled simultaneously by covering or uncovering an air hole in the tow board's rear edge. The boat moves only while the skier's thumb blocks the hole.



WITH HATCH OFF, outboard motor (a Mercury Mark 25) and controls look like this from the bow. Only major change made in the 75-lb. engine was to shorten its propeller shaft.

LAUNCHING THE SKI HORSE takes Lee Simpson, its inventor, just a few minutes. He backs a 100-lb. homemade trailer into the water, floats it off and attaches the control lines.



ENGINE-CONTROL SYSTEM uses part of the engine exhaust. Stored in a tank, it supplies one low- and one high-pressure air line. Low-pressure line, ending at the tow board, controls a relay valve that opens and closes the high-pressure line. The high-pressure line does the actual work of moving pistons connected to the engine's gearshift and throttle. END

Short Cuts and Tips

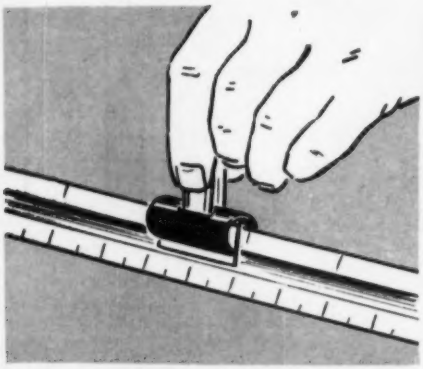
Easy Way to Make Model-Boat Masts

I SIMPLIFIED the chore of making model-boat masts for my son by showing him how to chuck one end of a dowel in the drill press, the other end turning in a hole bored for a loose fit in a short length of scrap board clamped to the table.

With the belt set to give slow speed, he now shapes the mast with course sandpaper and smooths it with finer grits.—*R. J. DeCristoforo, Los Altos Hills, Cal.*

▶▶▶BEFORE handling wood filler, I put a piece of plastic tape on a fingertip. I can then press filler into cracks and nail holes without having it stick to my finger.—*Frank Bayak, Iselin, N. J.*

▶▶▶NEXT time you cut linoleum, have a bowl of soap or detergent suds handy and dip the shears or knife occasionally. This keeps the asphalt backing from sticking to the blade, makes cutting easier.



Handle for Triangular Rule

A SPRING clip on a triangular scale rule can eliminate the irritation of that repeated search for the scale you're working with. Just snap the clip over the edge opposite the wanted scale. Now, any time you pick up the rule you have the right scale, and the clip serves as a handle.—*R. Mathio, Lake Grove, Ore.*

Data File in Snapshot Book

IF YOU have to refer often to a variety of data such as that required by draftsmen or machinists, try keeping notes in a small snapshot book of the kind available in dime stores. Type the information on small cards and insert them in the plastic envelopes where they can be read and will remain clean.—*C. C. Cooley, Detroit.*

A Message Center for the Kitchen

THIS busy center in the home of Phil Harris and Alice Faye blends with other redwood in the room.

Notes are chalked on a blackboard framed in redwood nailed to the wall. Storage shelves in the phone stand accommodate the toaster and other kitchen equipment.

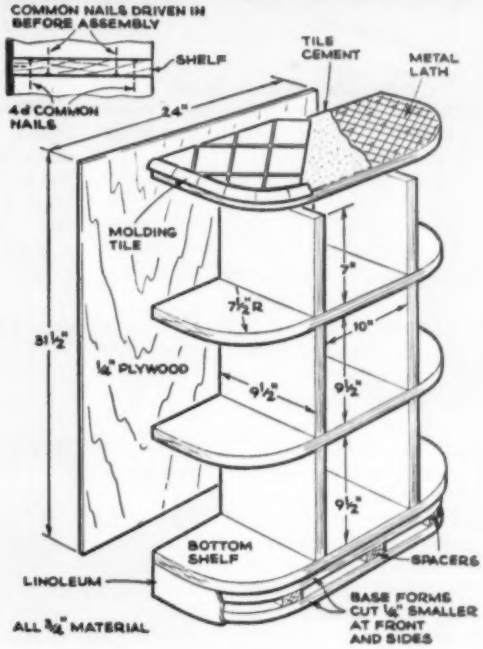
A clever assembly procedure conceals all nails:

First the lower uprights were nailed to the bottom shelf from below; then two base forms, separated by 3/4" spacers, were nailed to the underside of the shelf.

Next (here's the trick) nails were driven through the underside of the first intermediate shelf and left to protrude above it. This shelf was nailed over the lower uprights and the intermediate uprights driven down on the protruding nails. The next shelf and uprights were installed in the same manner, and the top was nailed to the top uprights.

After sealing the top to prevent warping, metal lath was nailed over it, and the top tiles pressed into tile cement spread over the lath. Molding tiles were cut into short segments to fit around the curved edges.

A natural finish was applied, and the base was covered with a strip of the linoleum used on the floor.—*Hi Sibley, Nuevo, Cal.*

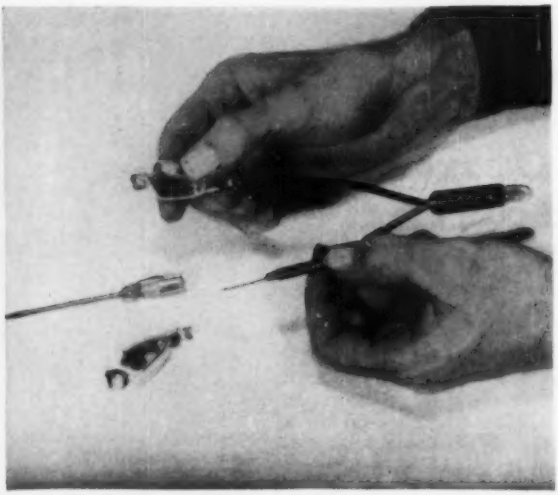


Short Cuts and Tips

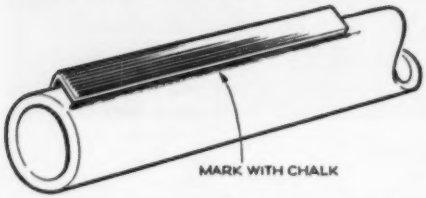
Making Neon Test Light More Useful

WITH a battery clamp or alligator clip on one or both probes, a neon tester can be hooked into circuits without being held.

This frees your hands for working at a distance or in tight places where it is hard to keep track of both probes. —*Richard Hanscom, Elmhurst, Ill.*



Marking Pipe Made Easy



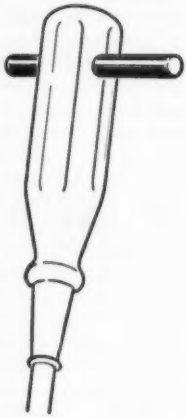
FOR a time and trouble saver when marking lateral lines on pipe, use a piece of angle iron as a straightedge and mark the lines with chalk.

Because it has two edges, the angle iron will lie true. For long lines you simply move the iron along the pipe, aligning with the end of the line already marked.—*John Krill, North Lima, Ohio.*

Better Grip for Screwdriver

INSERT a 3/8" steel rod through a hole drilled 3/4" from the end of the handle of your largest screwdriver, to provide extra grip. With it you can turn a screw tighter than with an ordinary handle.

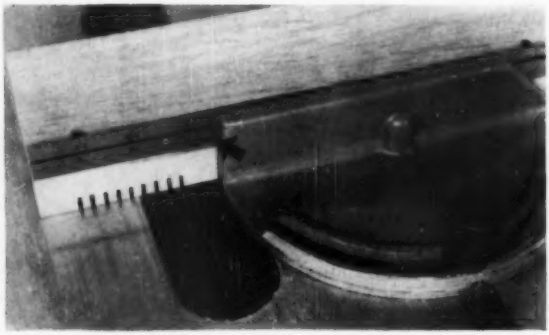
It also makes it easier to remove a stubborn screw. Cut the rod so it will extend 1 1/4" on each side of the handle. —*John Mihalick, East Liverpool, Ohio.*

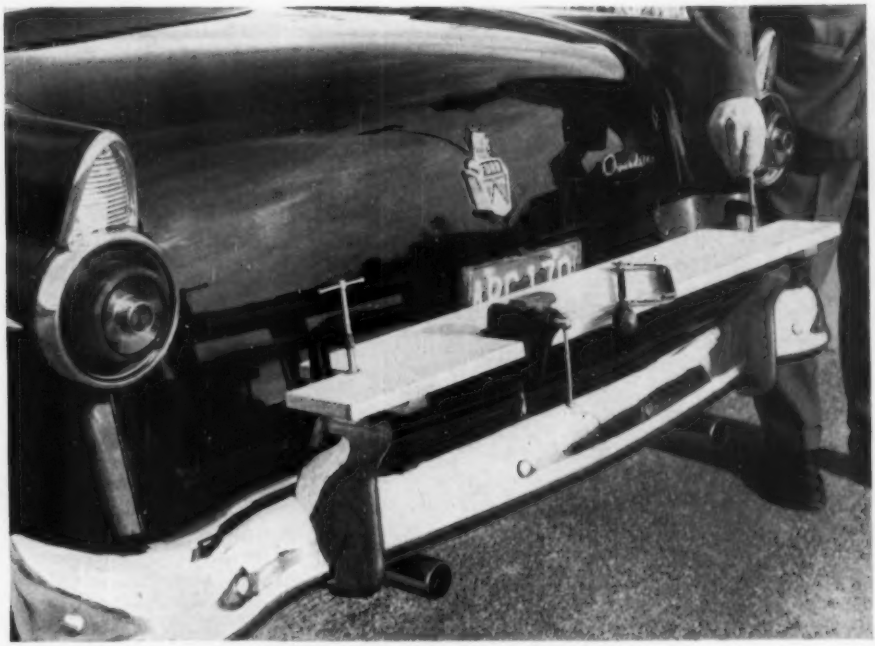


Ruler Helps Saw Equally Spaced Slots

NO NEED to lay out a number of slots, such as those to hold separators in a record cabinet.

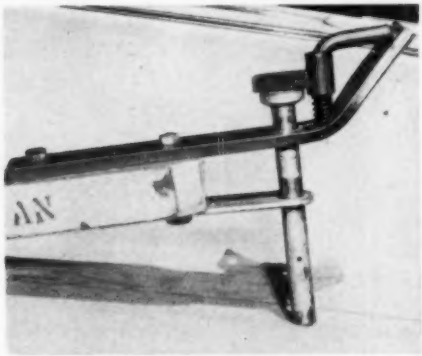
Instead, attach a ruler to the work with overlapping tack heads. Read the graduations against the side edge of the miter gauge as the work is moved to cut each slot.—*H. J. Gerber, Stillwater, Okla.*





Bumper Workbench for Back-Yard Car Repairs

WHEN I'm doing car repairs out in the open, a 4′ length of 8″ shelving, clamped across the top of the rear bumper guards, supports a small vise and provides a clean work area for laying out small parts. The shelving takes little space because it can be stored flat in the trunk of the car. —*O. A. Nelson, Seattle, Wash.*

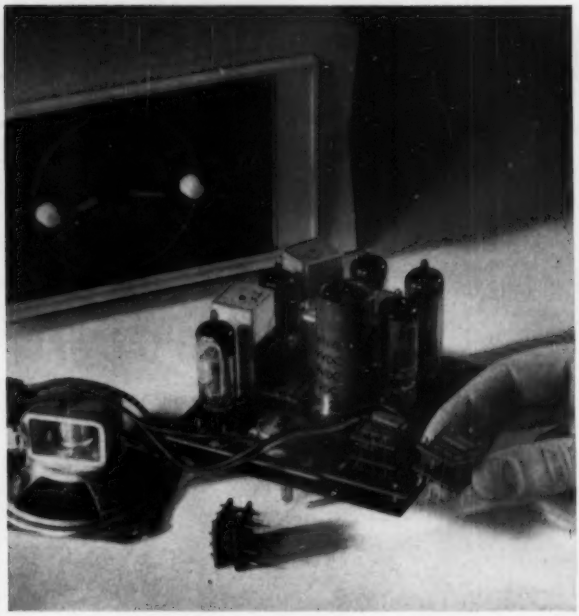


Keeper Holds Hitch Pin Secure

A SPRING-LOADED keeper holds this trailer hitch pin in place despite bumpy roads. Pressed down on its spring and flipped to one side, it releases the pin for easy unhitching. Swung into position over the head of the pin, it holds it firmly in place.—*John Hartl, Cedar Rapids, Iowa.*

It Used to Be a Crosley

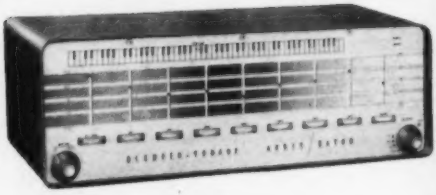
A HUNDRED dollars and labor of love built this little hot rod from an old Crosley sedan. Modifications on the original body and frame created the outer effect, without changing the basic structure. Handling is excellent at speeds up to 65 m.p.h.—*John H. Weber, Anchor, Ill.*



Plug-In Parts Make a Clock-Radio

MODULE plug-in circuits and a printed circuit board make it almost impossible for even a beginner to go wrong in putting together this kit. All resistors and condensers are pre-assembled in stacked modules that plug into the circuit board. Diagrams and instructions show you how. Tuned circuits are pre-aligned so that the set is ready to play as soon as it's assembled.

It has all the usual clock-radio features. Appliances up to 1,800 watts can be controlled automatically. (The kit and the stereo-control unit shown below are available by mail from Allied Radio, Chicago.)



New Hi-Fi Unit Tailors Music to Your Taste

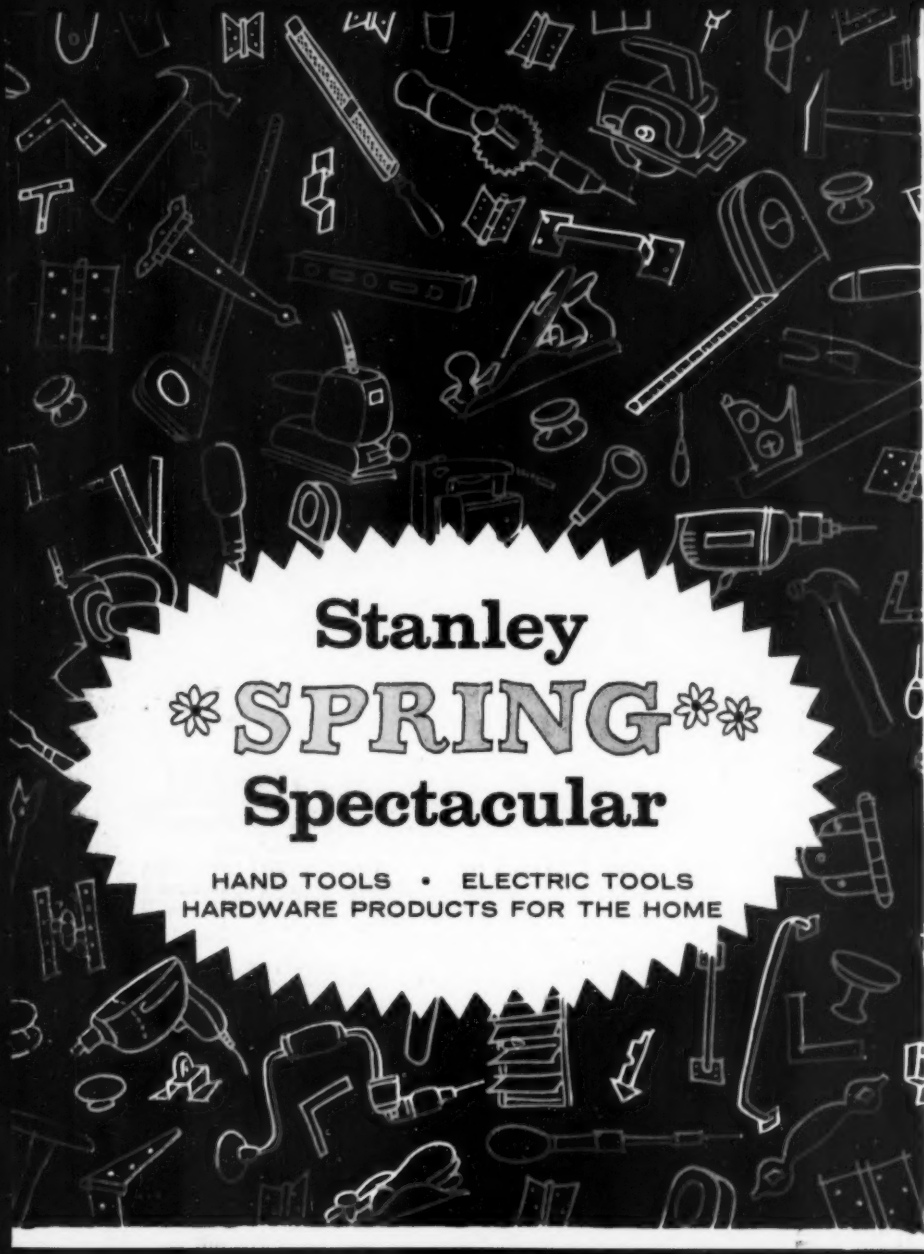
THE Audio Baton lets you become your own musical conductor, according to the makers of this unusual instrument. It gives you complete, octave by octave, control of the response of your hi-fi system. Unlike conventional tone controls that work only on the low or high frequencies, the Audio Baton gives you independent control of each octave over the entire audible range.

It is claimed that you can compensate for record deficiencies, room acoustics and individual hearing differences, as well as create your own special musical effects.

A unique feature is the visible response curve that lets you see at a glance the setting of each control in relation to all the others.

Kit Simplifies Stereo Conversion

FRETTING about how to add stereo to your hi-fi system? This stereo control unit connects between the output of the amplifiers and the loudspeakers. It provides centralized control of any stereo system using up to 20-watt amplifiers. No rewiring of amplifiers is needed. You get one-knob control of volume for both channels, balance control, phase-reverse switch and function selector. Instructions for use are included with the kit.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Spectacular
HAND TOOLS • ELECTRIC TOOLS
HARDWARE PRODUCTS FOR THE HOME

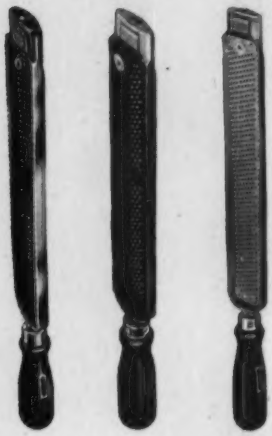
PRICES APPLY IN U.S.A. ONLY

STANLEY® HAND TOOLS . . .

STANLEY "SURFORM"®

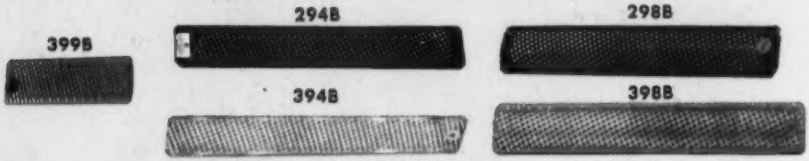
The first really new basic hand tool in 50 years!

295 295 HR 295FC



REPLACEMENT BLADES

(all except pocket size interchangeable)



No. 295 File-type. A fast, free-cutting tool. Never clogs, never needs adjustment. Hardwood handle. Aluminum body. 16⅝" over-all. $2.69

No. 295 HR File-type with new half-round blade for use on concave and circular surfaces. Body and handle same as No. 295. $2.89

No. 295FC File-type with new fine-cut blade. Can be used on metal as well as wood and plastics. $2.69

No. 296 Plane-type, for jobs requiring the control and feel of a plane. Aluminum body 10" long has hardwood handle and knob. $3.69

No. 399 Pocket. Handy touch-up tool for forming and trimming. Only 5½" long, fits easily in pocket. $1.49

No. 399B. Fine-cut blade for Stanley's new No. 399 Pocket Surform. 75¢

No. 294B. Flat regular cut for wood and composition. 98¢

No. 298B. Half-round regular cut for concave and circular surfaces. $1.19

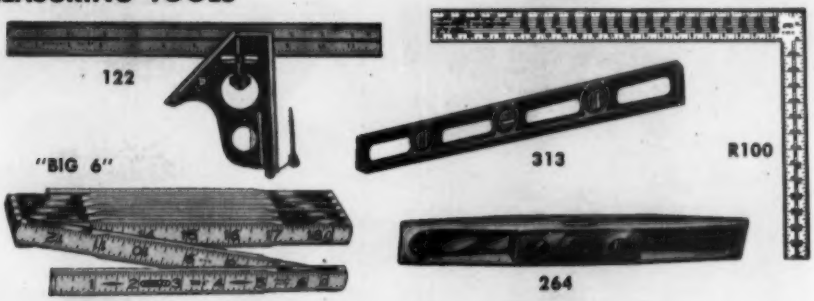
No. 394B. Flat fine-cut for metal and other hard smooth surfaces. 98¢

No. 398B. Half-round, fine-cut for irregular and concave metal forming. $1.19

PRICE ALL TIME TOOL FAVORITES 1525

built better to build better with!

MEASURING TOOLS



122 Combination Square. Belongs in every tool kit. Used as tri-square, mitre square, plumb, level, depth gauge, marking gauge and straight edge. 12" tempered blade precision ground. Square and parallel graduated in 8ths, 16ths and 32nds. Has scriber and level vial in cast iron handle. $3.40

313 Aluminum Level. Sturdy, accurate, all-purpose level. 2-5/16" x 1" x 24" with two double plumbs and one double level. Has replaceable protecting glasses, black and aluminum finish. $8.50

R100 Rafter Square. A basic tool for home construction. Body 24" x 2", tongue 16" x 1½". Polished finish. Graduated in 16ths on face; 16ths, 12ths and 10ths on back. Rafter tables on body. Supplied with booklet on how to use. $5.30

"Big 6" Folding Rule. New rugged 6' rule with 30% thicker sticks and permanently lubricated king-size joints that provide more strength and rigidity. $2.00

264 Aluminum Torpedo Level. Handy and lightweight for all tradesmen and handymen. Three vials—plumb, level and 45°. Size 9" x 1¼" x ⅝". $2.95

X226 Four-way Extension Rule. Finest, most versatile rule made. Used as folding rule, marking gauge, slide extension for inside and outside measurements. Plastic-coated, easy to read, 6 ft. long. $2.80

187 Line Level. Clips on line or cord to determine grades for laying pipe and brick; trimming hedges, etc. Made of aluminum. 85¢

1206W Tape Rule. 6 ft. long, ½" wide, easy to read black markings on white plastic-coated blade. D-shaped chrome-finished case. $1.10

3610W Tape Rule. Extra wide ¾", extra long 10' tape rule, provides greater rigidity for extended measuring of plywood and hard-to-reach overhead members. White finish, clear black numbers. D case chrome-plated. $2.49

1050 Chalk Line Reel. An inexpensive, handy, marking device for construction, garden and play area layouts. Aluminum case, with plumb bob point and universal hook for easy operation. $1.69

ALL TIME TOOL FAVORITES

299 Utility Knife. Cuts wallboard, paper, cardboard, fabrics, linoleum and veneer. 5½" long. **$1.00**

101 Trimming Plane. Handy "one-hander." 3½" long, 1" cutter. Ideal tool for tight spot touching up. **$1.25**

116 Mitre Box. Well-built, inexpensive. Ideal for most home projects. Back, saw guide, and index plate made of heavy pressed steel; board of hard maple. Easy-set saw guide can be locked at any point from 45° to 95°. **$6.95**

No. 4 Plane. World's most popular, most used plane. 9" long, 2" cutter. True, smooth, machined sides and bottom. Handle and knob are genuine rosewood. Cutter made from selected tempered steel. **$11.00**

3012 Driver.* Close-quarter 1¼" blade, standard tip. 2¾" over-all. **55¢**

ST1½ Steelmaster Hammer. The finest all-steel hammer made! Specially heat-treated handle and claws. Face rim-tempered. Handle—chrome alloy. Grip—custom contoured neoprene. 16 oz. **$4.99**

220 Block Plane. Adjustable cutter. Bottom and sides milled and ground. 7" long, 1⅝" cutter. **$3.98**

1525 "SCREW-MATES." Combination drill/countersink. Does 4 jobs in 1. Works easily. Cuts screwdriving time in half. 22 popular sizes from ½" x #5 to 2" x #12. **75¢ ea.**

1722 Driver for recessed Phillips head screws. Great time-saver around the car, appliances. Takes Nos. 5 to 9 screws. 8¼" over-all. **72¢**

3006 Driver. 4" x ¼" std. blade & tip. 7¼" over-all. **85¢**

3007 Driver. 6" x 5/16" square blade with standard tip. 10½" over-all. **85¢**

No. 60 Wood Chisels. Thin blade, butt-type. 3" long. A real craftsman's tool. Tough steel-capped plastic handles. Forged, tempered and accurate cross-ground steel blades. ¼" to 2" sizes. **$2.60** up.

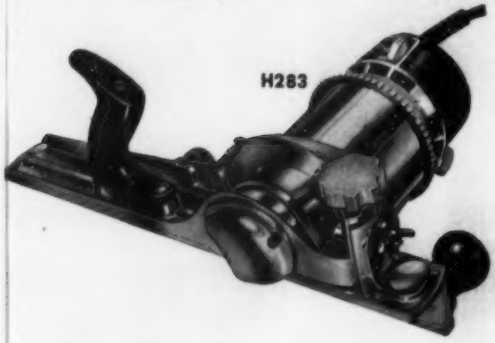
233H Spiral Ratchet Screwdriver. A push drill as well as a screwdriver. Has plastic magazine handle containing 2 screwdriver bits and 3 drill points. **$4.98**

45 Push Drill. Used to make pilot holes for screws and brads—in a jiffy. Plastic handle holds 8 drill points from 1/16" to 11/64". **$5.95**

* ***"Cushion-Core" Handyman Screwdrivers have special red plug set in tough plastic handles. Blades are forged steel with cross-ground tips.***

STANLEY ELECTRIC TOOLS

ROUTERS



H264 Heavy-duty Router. New inside and out. Makes hundreds of intricate, decorative cuts . . . dadoes, dovetails, mortises. Has spotlight. Safety switch locks shaft. Bits change with one wrench. 7/8 hp. **$62.50**

H297 Builders Kit. With new 7/8 hp router, plane attachment, templets, etc.—everything you need for hanging doors to fitting windows. **$166.50**

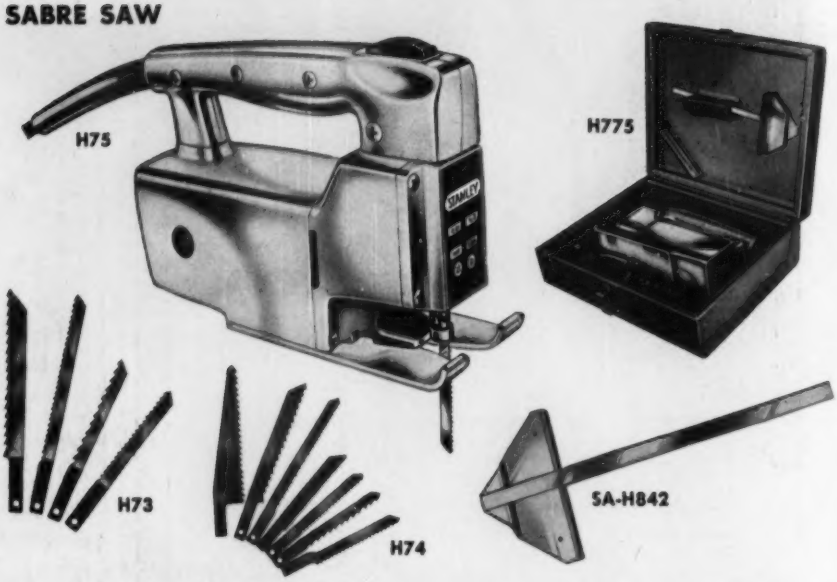
H208 Bit—$1.70 H512 Bit—$5.65 H112 Bit—$3.55 Just 3 of hundreds of Stanley high-speed steel router bits.

H283 Power Plane. Ideal tool for high-speed planing jobs. Heavy-duty 7/8 hp motor, 16" shoe with tilting arbor. Cuts 2-1/16" wide, 3/32" deep. **$89.50**

H45 Router. 1/2 hp, rugged yet lightweight—easy to use on vertical work. **$49.50**

Built for the professional . . .

SABRE SAW



H75 Sabre Saw. A powerful professional tool, yet priced lower than any other heavy-duty sabre saw. Cuts laminates, plastics, 2" wood—even ½" steel bar! Cuts flush to wall, starts own hole. **$54.50** with 3 blades.

H775 Kit. Includes H75 Sabre Saw, 8 blades, ripping guide, sturdy metal case—**$69.95**

H73 Blade Pack. 4 blades for cutting hard plastics, veneers, laminates—**$5.25**

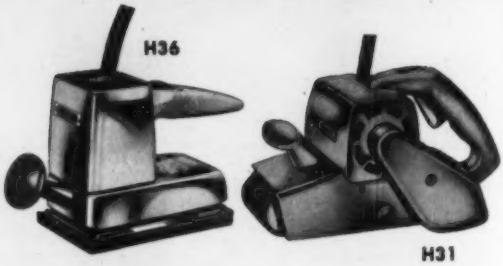
H74 Blade Pack. 7 blades to handle nearly any cutting problem—**$6.95**

SA-H842 Ripping Guide. For straight cuts 6" wide; circular cuts 12" dia.—**$1.25**

SANDERS

H36 Orbital Sander. Heavy-duty professional tool. Gives furniture, boats, etc. a smooth finish fast. **$54.95**

H31 Belt Sander. Heavy-duty, non-slip belt drive for "hogging down" rough surfaces. Sands wood, metal—even glass! **$89.95**



STANLEY HARDWARE

priced for everyone!

DRILLS

H131 ¼" Drill. Full 3.0 amps. Most powerful ¼" drill you can buy for **$24.95**

H136 ⅜" Drill. Heavy-duty, ball-bearing, industrial-rated. Tackles the big jobs with power to spare. **$39.95**

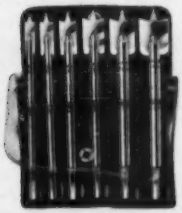
H12 ½" Drill. Tremendous torque, ideal speed for really tough jobs. **$54.50**

H181 Screwdriver Attachment. Impact-type. Provides top torque to seat screws fast, easy. **$8.95**

H550 Power Bit Set. 6 high-speed, moly-tungsten, steel-head bits—⅛" to 1"—in handy plastic kit. **$7.80**

H145K "Swirlaway" Sander Attachment for ¼" drills. Won't mar, scar or run off work. **$4.95**

H80 Drill Kit. Includes H131 drill, 28 accessories plus steel case with tray. Perfect for keeping your gear together. **$44.95**



H550

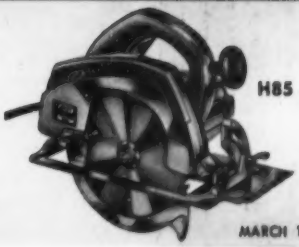
H145K

H80

BUILDERS SAWS

H85 Builders Saw. 8", heavy-duty "workhorse" for builders everywhere. **$89.95.** One of a whole new line of ultra-high power saws from 6-½" to 7".

See Stanley's all new builders saws at your dealer's April 1st!



H85

STANLEY HARDWARE . . .

CABINET HARDWARE

4240 Ceramic Pulls in pink, blue, yellow add colorful touch to any room. On bronze or silver bases. Popular 1-¼" size 65¢ ea.

4230 and 4231 Floating Rings—graceful modern styling in bright, clean chrome or antique copper. 4230—75¢ ea. 4231—95¢ ea.

4234 and 4235 Square Concave Knobs and Pulls with their clean, sheer look are ideal for today's modern kitchens. In chrome or antique copper. 4234 1-½"—65¢ ea. 4235—85¢ ea.

41ALD Magnetic Catch closes cabinet doors quietly, tightly. "Floating" magnet adjusts automatically to door warping. 40¢ ea.

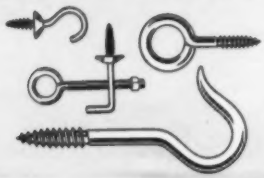
35K Steel Catch has rubber rollers that prevent noise, hold door away from cabinet. 30¢ ea.

34K Steel Catch with jaw-type hold, automatically adjusts to strike. Efficient, yet inexpensive. 23¢ ea.

39K Catch. Bright zinc-plated steel with floating strike adjusts to door warping. Closes accurately, tightly. 17¢ ea.

Your dealer has all these smart Stanley cabinet hardware items displayed on a convenient self-service rack.

BRIGHT WIRE GOODS



Stanley screw eyes, S-hooks, cup hooks, shoulder hooks, screw hooks, gate hooks and eye bolts come in all sizes to solve nearly any minor household fastening problems—from storm windows to clotheslines. Be sure you get the sturdiest, best made wire goods available . . . ask for Stanley!

bright ideas in beauty and convenience

BI-FOLD HARDWARE

2989 and 2983

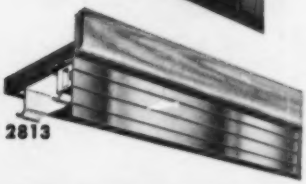
2989 and 2983 Stanley Bi-fold Hardware. Saves space, lets you have full access to rooms or closets. Installs in minutes. Adjusts with turn of a wrench. Doors hang perfectly, work silently (all contacts by nylon pivots, guides). See Stanley's new 2989 concealed bi-fold hardware for passageway doors, or 2983 surface-mounted for bi-fold closet doors, at your dealer's. For 4 ft. opening—**$8.00** for the complete set.

2800. Here's the way to "modernize" storage or closet areas in the house, garage, or cellar—with sliding doors equipped with Stanley's smooth-working by-pass hardware. Track, hangers, floor guide and screws come in one complete package. Installed quickly and easily with just a screwdriver. For 4 ft. opening—**$5.25** per set.

2813 Aluminum Fascia Trim for by-passing doors, stays bright and neat. Strong, easy to attach. **$1.65** ea.

BY-PASS HARDWARE

2800



2813

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CONTINUOUS HINGES

SC-311

Stanley Continuous Hinges come in nearly any width and in lengths up to 72". Ideal for boat lockers, hatch covers, fold-away bars, desks, chests, attic hatches, screen doors, etc. In several finishes and metals. SC-311 (shown) in nickel or brass. 1-1/16" x 48" or 1-½" x 48"—**$2.76**

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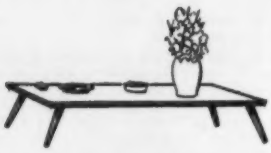
Here's a really inexpensive, practical way to make old tables, beds, etc. look like new and to fit any type of new unfinished furniture with attractive sturdy legs—Stanley's brand new wood furniture legs, precision-made in smart modern styling with solid brass ferrules and steel glides.

Available in 4 finishes: Ebony, Mahogany, Walnut, and Natural (unfinished); and in 8 different lengths from 4 inches to 28 inches. Perfect for any room decor. Legs screw into a separate, adapter-type steel base plate which can be easily mounted on the bottom of the furniture.

Legs can be fitted to wooden or metal bed frames. Provide strong, solid support.

Perfect for modern or contemporary-type chairs. Can be mounted at angles or straight up and down.



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	LENGTH IN INCHES							
	4	6	8	12	16	20	24	28
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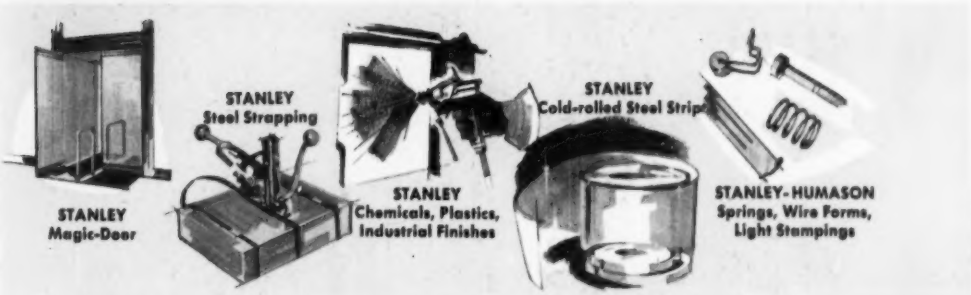
*Price is for individual sets. Set includes 4 wood legs with ferrules and glides; 4 steel base plates; 16 mounting screws.

NOTE: If your dealer does not yet have Stanley's new wood furniture legs in stock, send order to: Stanley-Judd, Div. of The Stanley Works, Wallingford, Conn.

STANLEY is a name known where people buy

STANLEY is a name known where people work



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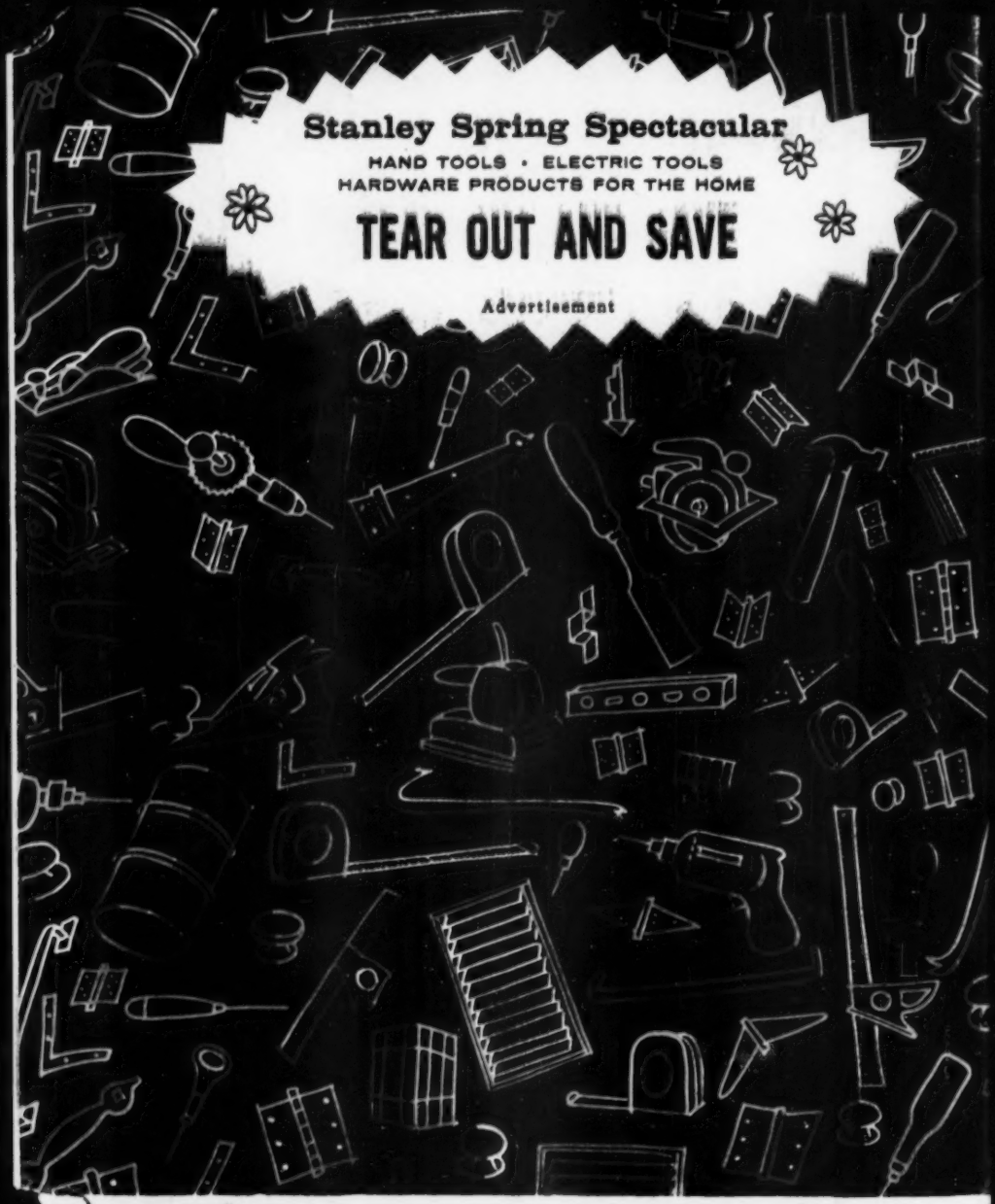
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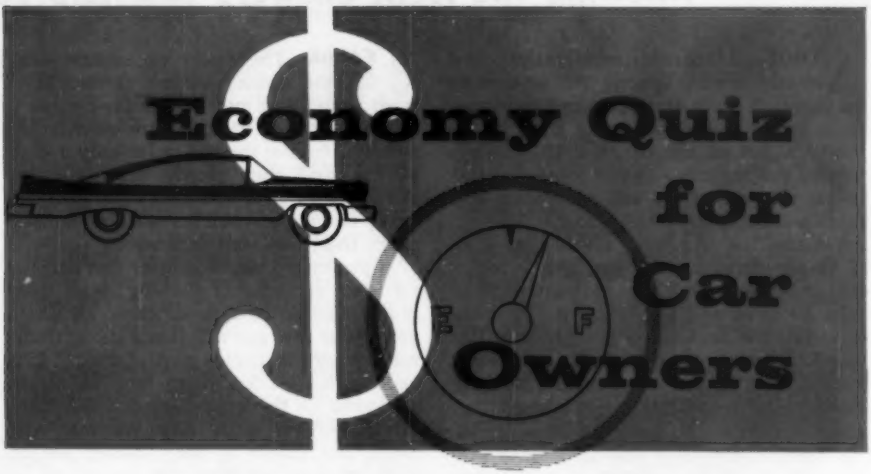


Five of these statements are false. If you can't spot them you're wasting money

1 One of the simplest ways to drive economically is to develop the habit of accelerating moderately and holding a steady road speed. ☐ TRUE ☐ FALSE

2 When approaching a stop sign, or another car from the rear, an economical driver will let up on the gas pedal, allowing the engine to reduce forward speed, instead of driving up close and using the brakes hard to slow the car. ☐ TRUE ☐ FALSE

3 To prevent excessive wear, an engine should be warmed to operating temperature before driving. ☐ TRUE ☐ FALSE

4 The most efficient way to time an engine is to advance the spark until a slight knock, or ping, can be heard under acceleration. ☐ TRUE ☐ FALSE

5 Rotating the tires periodically will result in longer useful life. ☐ TRUE ☐ FALSE

6 Inflating tires substantially over the recommended pressures will help cut car-operating expenses. ☐ TRUE ☐ FALSE

7 Running shock absorbers beyond their useful life is poor economy. ☐ TRUE ☐ FALSE

8 The use of tune-up oil through the carburetor helps to keep the engine operating at better efficiency. ☐ TRUE ☐ FALSE

9 Premium-grade gasoline will give better mileage and performance in most automobiles. ☐ TRUE ☐ FALSE

10 A new car will give better performance if it is driven slowly during the first 500-mile break-in period. ☐ TRUE ☐ FALSE

11 Having the car tuned up and the ignition timed at regular intervals will save money by assuring top engine performance and gas mileage. ☐ TRUE ☐ FALSE

12 The car should be put in the garage when you are through driving, not left out doors to be put away after the engine has cooled. ☐ TRUE ☐ FALSE

To score yourself and see how you may be able to economize, turn to the following pages

Knowing the right answers can help you

1 TRUE. Moderate acceleration and steady driving speeds will save more on gasoline costs and operating expenses than any mileage stretching gadget that you can put on the car. Yet this simple way of getting more out of your gasoline dollar doesn't cost a cent, and can also save a nice amount on other operating expenses.

Steady driving, after you have reached cruising speed, will also pay off in savings. Drive evenly—don't slow down and then jab the throttle to pick up the lost speed. Every time you hit the gas pedal, even with a gentle acceleration, you are causing extra gasoline to be burned.

2 TRUE. Whenever approaching a stop sign let up on the gas at a sufficient distance to allow the engine to slow the car so that only minimum use of the brakes will be needed to stop. On approaching another car from the rear, slow down before you are riding his bumper and have to hit the brakes to keep from colliding.

Realized or not, it costs money every time you resort to unnecessary braking to reduce the car's speed. And it will cost you again to build up speed. Learn to think ahead. It's just poor driving sense to pay for increased gasoline costs by excessive braking.

3 FALSE. The faster an engine heats up, the quicker it can protect itself from wear. And one of the best ways to reach operating temperature quickly and safely is to idle the motor for only a short period, and then gently drive the car. An idling engine develops little heat and takes longer to reach an efficient temperature than one that is working easily.

A prolonged warmup time can account for a lot of wear in the engine as there is not enough heat to vaporize all of the gas. Some raw gas will reach the cylinder walls where it dilutes part of the oil film, leaving the piston rings free to scrape and wear on the unprotected walls. Long idling periods with slow warmup also cause the choke to stay closed longer. This in turn subjects the engine to an overdose of gasoline. It all adds up in time to shorter ring life, worn cylinder walls and, in general, lowered engine efficiency. So start driving right away—but easily—to bring the engine up to operating temperature quickly.

4 FALSE. This method of timing an engine has resulted in many costly repair jobs. Today's cars have better insulated and soundproofed engine compartments, making it very hard to hear slight engine knocking, or pinging.

To be safe, do not advance the ignition timing beyond factory specifications. If your car should knock when timed according to specifications, then you are not using fuel of high enough octane. Either use a higher-octane (premium) gasoline or retard the timing a few degrees to work with the lower octane ratings. It is permissible to retard the spark slightly to use lower-grade fuels, but you should not attempt to advance it beyond specifications or you could inadvertently shorten the life of the engine.

5 TRUE. Tires should be rotated every 4,000 to 5,000 miles to equalize wear and to obtain best mileage. If one or two tires are found to be wearing faster than the others, it is only common sense to switch these tires to a location where they are subjected to less wear.

To obtain full useful life from the spare tire, it must receive a share of road

mileage, too. Make it earn its keep by using it on the car, and give each of the other tires, in turn, a free ride in the trunk.

There are several ways to rotate tires, but one of the most popular is to move the front wheels straight back to the rear, and then put the right-rear wheel in the trunk as a spare. Put the spare wheel on the left front, and move the left-rear wheel to the right-front position, to finish the job.

6 **FALSE.** Tires that are overinflated may give a small increase in gas mileage, but will suffer increased tread wear. When driven in an overinflated condition, tires begin to show signs of wear faster in the center section of the tread, and if the practice is continued this section will wear smooth while there is still a good amount of tread on each side of the center.

7 **TRUE.** Shock absorbers wear out and need to be replaced. Useful life for shocks can be as low as 15,000 to 20,000 miles on some cars, depending on road conditions. When shocks fail to control spring movement, the springs are subjected to greater stresses than they were intended to have. Springs bottom and surge, giving a bouncy, ocean-wave ride and leading to early spring failure and rapid tire wear due to wheel bouncing.

To check the shocks, grip a corner of the bumper with your hands and bounce the car up and down. When you let go, the car should return to level with very little rebound. Do this to all four corners to test each shock absorber. If the car bounces much past level after you have let go of the bumper, new shock absorbers are needed.

8 **TRUE.** A good tune-up oil will keep valves working freely by loosening the carbon gum on the valve stems. If left to accumulate, the gum can cause the valves to stick and later lead to burned valves and the cost of a valve job.

Tune-up oil also helps to loosen carbon-clogged rings so they, in turn, can control oil consumption. When rings become clogged with carbon they are no longer

able to perform their job of wiping excess oil from the cylinder walls, and the engine begins to use oil.

Remove the air cleaner and slowly pour about a pint of upper cylinder tune-up oil through the carburetor while keeping the engine running at a fast idle. Fumes and smoke will be heavy, so do this outdoors. As soon as the can is empty shut off the ignition and let the engine "soak" for about half an hour. Then start the engine and drive the car, preferably on the highway to blow out any loosened deposits.

9 **FALSE.** The added expense of premium-grade gasoline for many cars is money wasted. Premium gas will not give any more mileage than the lower priced regular grade unless your car is designed to use the higher-octane fuel. This means that unless you are driving a late-model car, with a high-compression engine, your car does not need—and cannot take advantage of—the highest octane ratings available today.

A few years ago when the majority of cars on the road today were built, you had to use the higher-priced gasoline to keep down engine knock and realize full power from the engine. But as the octane ratings of gasoline have increased, many car owners have found that the new regular grades work as well as the premium fuels that were offered when their cars were new.

Economy driving adds to your car's life, too

10 **FALSE.** Don't break it in too gently. If possible, avoid start-stop city driving and take the car out on the highway for the first 500 miles.

After the motor is thoroughly warmed up, drive at 35 m.p.h. for the first half-hour, letting up on the accelerator for a few seconds, about every half-minute. Watch for any signs of overheating. Then speed up to 40 m.p.h. and use the *up-and down-method* of break-in for about another 40 or 50 miles. Once every mile decelerate to 35 m.p.h. and then speed up to 45 m.p.h. and right back down to the original 40 m.p.h. This slight deceleration before speeding up will allow extra oil to be drawn to the rings, cooling and lubricating them, and the following acceleration will assist in seating the rings and other moving parts.

After about 150 miles, you can cruise at 50 m.p.h., but again use the up-and-down treatment for about an hour. Every minute or so coast to 45 m.p.h., accelerate to 60 m.p.h., and then let up to 50 m.p.h. After 500 miles, you can drive the car normally except for steady speeds above 65 m.p.h. Then all speeds are okay; but maintained high speeds should be avoided until you go beyond 1,500 miles.

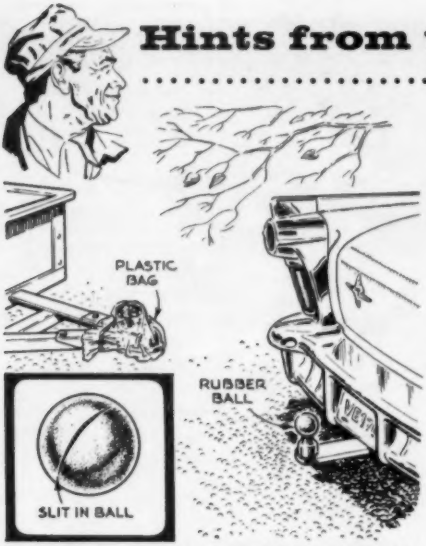
11 **TRUE.** Periodic tune-ups keep the engine operating efficiently for good gas mileage and top performance. Spark plugs collect carbon and electrodes wear. This means that plugs have to be cleaned and the gap set to specifications to insure proper ignition and power. Breaker points need to be cleaned and adjusted or, if badly burned, must be replaced. Burned and pitted points cause hard starting and lead to early failure of the battery. Points that have worn to an incorrect breaker gap will throw off the engine timing.

Timing should be checked with an ignition timing light after the points have been cleaned, or replaced, and adjusted. Reset the timing to factory specifications if it is not adjusted correctly.

The air cleaner should also be cleaned at this time to insure free passage of clean air to the cylinders. A dirty air cleaner will not filter out harmful dust particles. It also causes an over-rich mixture of gas to reach the combustion chamber, cutting down on gas mileage. Both the admission of dirt-laden air and an over-rich fuel mixture accelerate wear on rings, cylinder walls, and other parts of the power plant.

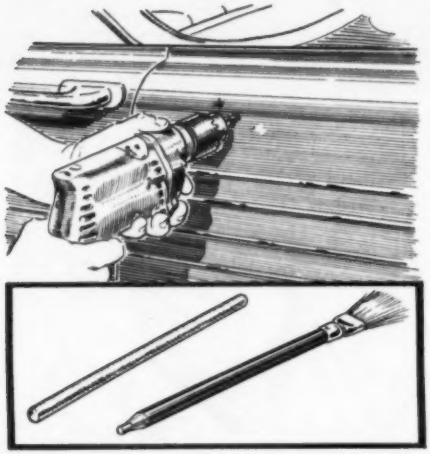
12 **TRUE.** Leaving the car out all evening and then driving it into the garage at bedtime is bad business; it can shorten the life of the engine. Much of the wear an engine receives occurs during cold starts and the first few minutes of running. Starting the car, only to run it into the garage, also leaves the cold engine with raw unburned gasoline to drain down the cylinder walls and into the crankcase oil. There it contributes to sludge formation. If left to accumulate for a long period, sludge will lead to an early engine overhaul. Drive into the garage, even though you might use the car again. It may be more bother, but it will save the engine.—*Robert V. Thompson.*

Hints from the Model Garage

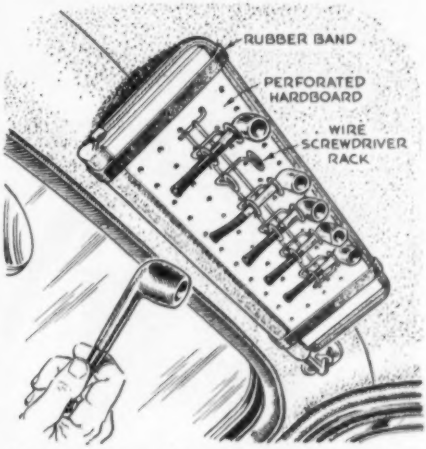


To weatherproof a trailer hitch while it's not in use, all you need is an old rubber ball and a plastic vegetable bag. Slit the ball enough to slip it over the metal ball of the hitch. Use a rubber band to hold the plastic bag in place.

Sudden stops harm new brakes. A new car or one with newly relined brakes should be broken in gently until the linings become burnished. Rough use during a break-in period often causes abnormal wear and may cause uneven brake action.



Erasing rust spots is neater and easier than sanding them off. The eraser can be a long pink one made for electric erasing machines or a wood-covered type used by typists. Chuck the eraser in an electric drill, letting ¼″ stick out.



Pipe-smoking drivers can keep a full set of pipes at hand by fastening a simple rack to the sun visor. It's made of perforated hardboard and has wire tool holders to slip the pipes in. Rubber bands are cut from an inner tube.

Please turn the page for more garage hints

More Hints from the Model Garage

A grease-gun extension of standard pipe (3/8″ fits most guns) will reach once-in-accessible fittings. About 1½′ long, it lets you pump the handle freely, away from grime. The grease gun can be pressed firmly because the extension is rigid.

With a shoe scraper always handy, mud and slush needn't dirty up the inside of a car. This swing-in, swing-out blade bolts to the car frame, and because it's spring-loaded stays put except when pushed sideways by the user's foot.

Installing a wire hose clamp in tight quarters needn't be a knuckle-buster. Before slipping the clamp on the hose, expand it until the ends touch and slip a small washer over them. When the hose is in place, pull off the washer.

A bump strip keeps concrete block from scratching a car's paint job when the door is opened inside the garage. A 3′ length of Celotex, 6″ to 12″ wide, makes a soft yet durable cushion. Masonry or steel cut nails at both ends hold it.

For the safe, dependable power they *must* have, most aircraft use Champions. Above, Cessna float plane.

Q. Why do *more aircraft the world over* use Champions than any other spark plug?

A. In the air, *dependable* power is vital! To get that same dependable power in your car, put in new Champions every 10,000 miles. You'll save gasoline, too!

World's favorite spark plug—engineered for every car built by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard and every major foreign maker.

CHAMPION

Gus Plants

By Martin Bunn

His eyes wistfully on the calendar scene, Gus thought about the car. An idea nudged him, suddenly clicked.

an Idea

THE '57 Lincoln had its oil pan down. Gus Wilson held a rear main-bearing seal in his hand. It was shot. So was his weekend, Gus thought, looking up at a hunting scene on the Model Garage wall calendar. The month read March; the next day's date, Sunday, was circled in red. There was a promise of early spring in the air.

Stan Hicks, his assistant, hung up the telephone. "No luck, boss," he said. "Higgins hasn't got that main seal in stock and he can't get one until Monday."

"There goes my hunting trip," Gus said.

"Why not use your own car?"

"You know the agreement I made with Sam Barton. If I didn't fix his Lincoln in time we'd call off the hunting and put in Sunday fixing up his basement bowling alley."

The phone rang. "Maybe Higgins found that part," Stan said hopefully as Gus took the call. It was Ed McBain.

"My garden tractor won't run, Gus. And Hogan's out in his plot making the dirt fly. If you don't come over and fix it he'll beat me on the first mess of green peas and I'll never hear the last of it."

"Okay," Gus said, and hung up the phone, grinning. "Hogan and McBain are at it again. Hold the fort, Stan, while I'm off to the battle of the green thumbs."

The phone rang again. This time it

was Hogan's voice in a conspiratorial whisper. "Slip over here with your tool box, Gus. My tractor's broke down but I don't want old Pig Weed McBain to know it."

Gus winked at Stan. "That's strange. McBain just called and said you were making the dirt fly."

Hogan cackled over the phone. "He just thinks I am. My motor runs okay and I've got it spitting with the muffler off. But when I throw in the clutch nothing happens."

AS HE drove out of town Gus mulled over the situation. He was bound to call on McBain first. But with the backyard garden plots of the two crotchety old rivals separated by only a four-foot-high hedge, Hogan was sure to see him arrive. And with both tractors out of commission, he knew he was heading for fireworks. He wasn't mistaken.

He found McBain, a thin, wiry man, blue of eye and reddish of beard, yanking the starter cord of his tractor. As Gus approached he looked up and snorted, "I'd like to get my hands on the guy who built this contraption. Durned motor won't turn over."

"That's one of the best little motors ever built, Ed." Gus took the starter cord and gave it a few futile yanks.

"Best, eh?" McBain cocked an ear toward Hogan's yard. "Listen to that. Old Spinach Beard couldn't run a two-bit screwdriver. But his motor runs and mine don't."

Gus removed the gas-tank cap and stuck a finger into the fuel. "As a matter of fact, your motor and Hogan's are identical."

"Maybe so," McBain said. "I'll wager that old reprobate snuck over here last night and put emery dust in my motor. I'll go over there right now and twist his . . ."

"What in time are you doing over there, Gus Wilson?" It was Arch Hogan, his whiskered chin jutting over the top of the dividing hedge.

"Fixing Ed's tractor," Gus said, a twinkle in his eyes. "Wouldn't be anything wrong with yours, now, would there?"

"Course not," Hogan said hastily. "You can hear it running if you're not deaf. I'd better get back to it. My, how things are growing this spring. Got peas three inches high already."

"Hogwash!" McBain said. "Peas up three inches! Why, he's just planting them now. Couldn't work the ground until this morning—too wet." The old man took off around the end of the hedgerow, Gus behind him. They came upon Hogan, a silly grin on his face, leaning on the handles of his racketing but motionless tractor.

"By grabby!" roared McBain. "He isn't going anyplace, either."

"Who told you to come peeking around my hedge, Pig Weed?"

"*Your* hedge? The plants you put down didn't grow. Every last plant in that hedge that grew, I planted."

Hogan snorted. "You couldn't grow wormy radishes."

"Whoa!" Gus cut in. "Neither of you is going to grow radishes or anything else if you don't stop squabbling and let me look at your tractors. McBain's motor seems to be frozen up. Now let me see what's the trouble with this one."

"McBain must have slipped over last night and put metal in my gearbox."

"And who sneaked over last night and put emery dust in my motor?"

"Would have if I'd thought of it," Hogan admitted.

Gus, down on his knees, was removing the differential grease-drain plug from Hogan's gearbox. "Guess it'll take about a week to get parts from the factory. Then, let's see, a couple of days to install them. Say about 10 days to get you boys running again."

McBain's rheumy eyes popped. "Ten days! Why, in 10 days it'll be too late to plant peas, that is, peas that'll grow right. Hot weather'll catch them before they fill, and then . . ."

"And then," Hogan put in, "they'll sort of peter out. They'll make up small and not sweet."

"That's right. Just like those peas you shipped in from the South last year, Hogan, and made believe you'd grown 'em yourself."

"Shipped in from the South!" Hogan took a threatening step forward. "I'll have you know, Pig Weed, that I beat you fair and square last year. I'm of half a mind to . . ."

"Stop it!" Gus stepped between them. "If you two will calm down a minute I'll

show how you both can get your peas in —and today."

"You will?"

"How?"

"Well," Gus explained, "your tractors are identical. McBain has a good chassis and gears, while you, Hogan, have a good motor. Now, if I mount your motor on McBain's rig . . ."

"Not on your life," Hogan protested. "Let Pig Weed rustle up his own motor. Any time I deal with a character who'll sneak around jimmying folks' gears you'll know it."

"Is that so?" McBain yelled. "And you can get your own gears. Before I'll deal with a snake in the grass who sneaks over putting emery dust . . ."

"Time out," Gus said, holding up a hand. "I'd say both of you green-thumbed idiots got so excited this morning you forgot something. I'll bet McBain forgot to mix oil with the gas for his two-cycle motor. And you, Hogan, probably drained your gearbox last fall, just like the factory instruction book says, and then forgot to put grease back in. Now . . . let me make one good tractor out of both of these."

Hogan shook his head. "Nothing doing."

"But," McBain said uncertainly, "it might rain, Hogan, and muddy up the ground again. Ten days is a long time."

Hogan pulled at his whiskers. "Come to think of it, Pig Weed, maybe I did drain my gearbox last fall."

"Admit it, do you?" McBain said. "Well now, in that case, maybe I did forget to mix oil with my gasoline."

Gus held up two fingers in a V sign. "Well, we won't get anywhere standing here chewing the fat. Let's shift the motor."

"Let's," said McBain.

"Don't mind if we do," agreed Hogan.

Driving back to the Model Garage, Gus chuckled aloud to himself, wondering what McBain and Hogan would say if they knew he could have gotten the parts and installed them in a couple of hours. But getting the two old gamecocks to work together, he figured, was more important.

Gus still had his own problem—Sam Barton's Lincoln with the oil leak that meant no hunting trip. His eyes strayed wistfully to the hunting scene on the wall calendar as he thought about the car. An idea kept nudging him. Then, suddenly, it clicked. "Identical parts," he said aloud.

"And what's the name of that amusement park where you work?"

In the garage office, he thumbed through his parts manual. "Ah, here it is, Stan," he said, running a finger across a page. "The crankshaft rear oil seal of the '57 Lincoln also fits '57 Fords. And that means vice versa. Get it, Stan?"

"Sure, boss, but this is Saturday and the Ford dealer . . ."

"Never mind the dealer. What's your car?"

"Why, a '57 Ford . . ." Then it dawned on him what Gus meant. "No, not that."

"Yes, that. Get going and switch those identical parts so I can go crow-shooting tomorrow."

Stan was finishing up when Gus came out of the office, a shotgun in each hand. "Here's a gun for you, Stan," he said. "Come along with us." END

Next month: Gus challenges an electronic marvel.

TAXI ENGINES RUN 200,000 MILES . . . AND SO CAN YOURS!

Do as fleet owners do—replace key parts and get like-new pep and power!

Your car engine is *not* worn out at 40,000 or 50,000 or 60,000 miles. Take a tip from the experts who own and run huge fleets of cars and trucks. Overhaul the engine, replace key parts such as bearings and rings . . . and get back all the pep and power of a brand-new car!

SYMPTOMS OF BEARING WEAR

Your car will tell you when it needs new engine bearings. Is it sluggish or slow; does it miss, knock or ping? Is your gas mileage low; do you need oil *again?* Are spark plugs fouled with sludgy black oil and carbon? Then it's time for an overhaul—and new Federal-Mogul bearings.

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You're wasting money on any overhaul that doesn't include new engine bearings. Parts account for the smaller portion of the cost, so it pays to do the job *right* the first time. Even new piston rings can't control the 25-times normal oil throw-off from worn engine bearings.

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Bearings are the heart of your engine. Yet when you need main, con rod or camshaft bearings, *it costs no more* to use the best—Federal-Mogul Engine Bearings. Ask your mechanic . . . he knows and trusts Federal-Mogul quality!

FEDERAL-MOGUL SERVICE

Division of Federal-Mogul-Bower Bearings, Inc. • Detroit 13, Mich.

Nature's Phony Villain

[*Continued from page 85*]

around their bodies so they can bring 'em up.

Newman himself has proved how wrong Victor Hugo was in labeling the octopus the terror of the deep. Newman turns his into pets. He does it because you can train an octopus, which can learn, and can remember what it learns. For perhaps the most amazing thing science has discovered about the cephalopod is its brain: Connected to a marvelous nervous system, and to eyes as good as, and in structure almost identical with your own, the brain makes the octopus one of the keenest-witted creatures in the sea and certainly the smartest of all animals without backbones.

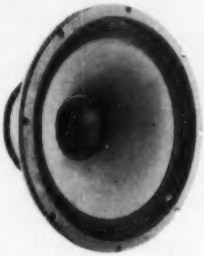
Next Month: Is the "dumb" or reckless driver always to blame for accidents? Not so, says Ed Fales in his eye-opening article on "Stupid Traffic Rules." Foolish laws and confusing signs can turn any law-abiding citizen into a violator. For the full story, don't miss April Popular Science.

The high I. Q. of the octopus is what permits Murray Newman to teach his pets to show the public how harmless they are. Describing one of them, Newman writes: "When the octopus sees his keeper above his tank, he blushes with excitement and stretches his arms up toward the surface. The tendril-like tips curl up over the side of the tank and will wrap around a finger as delicately as a baby's hand."

And Cecil Brosseau, of the Point Defiance Aquarium in Tacoma, proves the tameness of the supposedly fierce octopus by having his octopuses take herring from visitors. The visitors include kindergarten children.

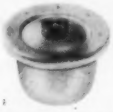
Says one naturalist: "They have missed the status of brainy intelligence, of which man is the foremost example, only by a very narrow margin. There is good evidence that at one time the forefathers of the present octopuses very nearly ruled the world. Had they been able to pass the barrier of the edge of the ocean . . . there might have been no limit to the amazing forms which might have peopled the earth." END

RW-489 12" SOFT SKIVER WOOFER: Properly mounted in a Stromberg-Carlson *Acoustical Labyrinth* quarter wave-length duct enclosure, this woofer produces a flat response to 18 cps, with minimum distortion and excellent transient response. $49.95.*



RW-490 15" SOFT SKIVER WOOFER: Properly mounted in an *Acoustical Labyrinth* enclosure, this speaker produces a flat response to 16 cps and below. $99.95.*

RT-476 2¼" TWEETER: Cone tweeter with effective frequency range to 18,000 cps with minimum distortion, wide angle of dispersion. $9.95.*



RT-477 INDUCTION TWEETER: An exclusive Stromberg-Carlson design. Dispersion angle: 140°. Flat in response up to and over 20,000 cps. Power-handling capacity: 50 watts. $49.95.*

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RH-417: Designed for RW-489 Woofer or RF-481 and RF-482 12" Transducers. Cutouts to mount one 12" speaker, one 12" or 8" speaker and two tweeters. Cherry or walnut. 32½" x 33¾" x 16¾". $129.95.*

RH-412, RH-413: Corner or wall cabinets for 12" speakers. 32" x 28⅛" x 18½". RH-412 in mahogany or cherry; RH-413 in walnut or limed oak. $89.95.*

RH-414: Corner cabinet for 8" speaker. Mahogany, walnut or limed oak. 24½" x 19" x 10". From $34.95.*

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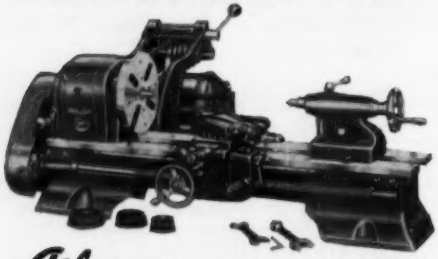

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House Paint that Lasts 50% Longer

[*Continued from page 100*]

—with an oil-type primer or penetrator required as a first coat under certain conditions. Nobody is arguing the point.

But if you're a slap-dash brush artist, prepare for sober reflection when you read the instruction booklet.

Preparing the surface. The substance of it is this: Luco-Tex takes very careful surface preparation. If wood has previously been painted, you must remove all traces of dirt, stain and chalk, and rough up any glazed areas, before applying Luco-Tex directly. Or, to speed the job, give your house the careful, but less thorough, preparation you would for repainting with oils or alkyds, and then apply Luco-Tex primer before applying the acrylic. On new wood always use a coat of oil primer, first. Directions for conditioning masonry range from simply removing dust from new unpainted bricks to sandblasting off heavy deposits of old cement-type coating.

Du Pont is slightly more conservative. While its chemists have plenty of evidence that their acrylic will have very long life when applied over firmly adhering old paint, they want to analyse exposure evidence gathered over the past winter before recommending it for previously coated surfaces.

Meanwhile, Du Pont is plugging its product only for masonry, and for wood that is either new or completely stripped of all previous paint. This limits its sale to a maximum of from 10 to 15 percent of the house-painting market. But there, Du Pont firmly believes, it offers the longest-lived beauty and protection ever bucketed.

Again, the accent is on a primer (alkyd type) that does two things: First, it prevents bleed-through of natural wood stains (no number of coats of directly applied acrylic can). Second, it forms a sandwich coat between expanding and contracting wood and the tough but more rigid finish coats (this prevents cracking).

So there you have it. Neither manufacturer—or any other reputable one in the acrylic field—wants you to use his product unless you're prepared to apply it as he recommends. There's too great a future in acrylic house paints to have them knocked down by ill-advised or careless application. END

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AC Spark Plug engineering, research, testing and manufacturing development has kept ahead of ever-growing engine demands!

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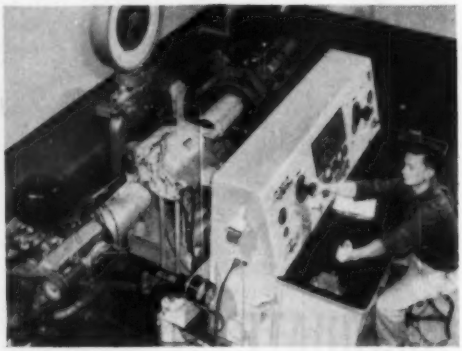

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America's Meanest Little Mountain

[*Continued from page 121*]

flying over the valley, Beals gave up and went back indoors.

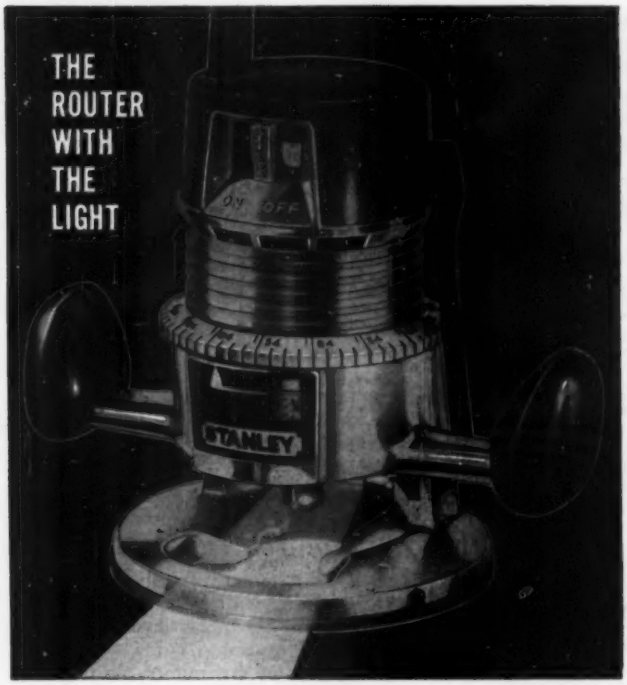
Things have not changed since Sergeant Beals' time. The present weather station on the peak has now been in operation for over 26 years. Its figures show that, on Mount Washington:

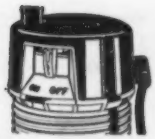
- From November to April, there is a wind of hurricane force (75 m.p.h. or above) on the average of at least every other day.
- In March, there is a hurricane wind two days out of three.
- The average winter wind velocity is about 55 m.p.h.
- In the summer, the wind is often four times as high as that of the lowland areas.

Mount Washington attracts wind because it is the highest point anywhere around and because it lies in a cyclone belt. The weather station has often clocked winds approaching 200 m.p.h. The great Boston hurricane of September, 1938, produced only a wind of 87 m.p.h. at its highest, with a pressure of 20 pounds per square foot. A 200-mile wind exerts a pressure of 80 pounds to the square foot of any surface it blows against. The buildings on Mount Washington—a summit hotel, TV and radio installations, and those used by the weather bureau and the military to house men who test survival gear and jet engines—are anchored by great steel bands whose ends are fastened in concrete. Even so, they have rocked like ships in a rough sea—a phenomenon that has been reported time and again on the mountaintop. In that 231-m.p.h. wind of April, 1934, their walls warped in and out almost as if they were accordions.

Brad Washburn, after learning mountain climbing on Washington, went on to become a pre-eminent explorer of Alaska. Says he: "I've never seen winds in Alaska worse than those on Mount Washington."

The sudden changes. On a clear day, that wind can pick up a fist-size cloud miles away, hustle it over to the mountain at airplane speed, and produce a storm almost instantaneously. Bob Cary, a Dartmouth College junior who is hutmaster at Lakes of the Clouds and has some years' experience in the region, says: "The weather can change in five





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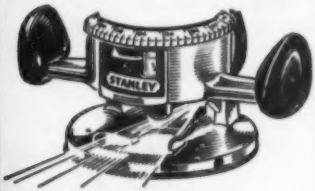

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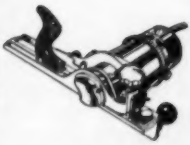

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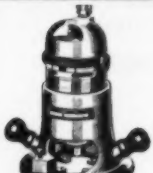
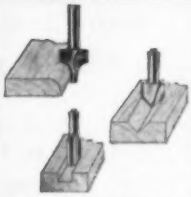
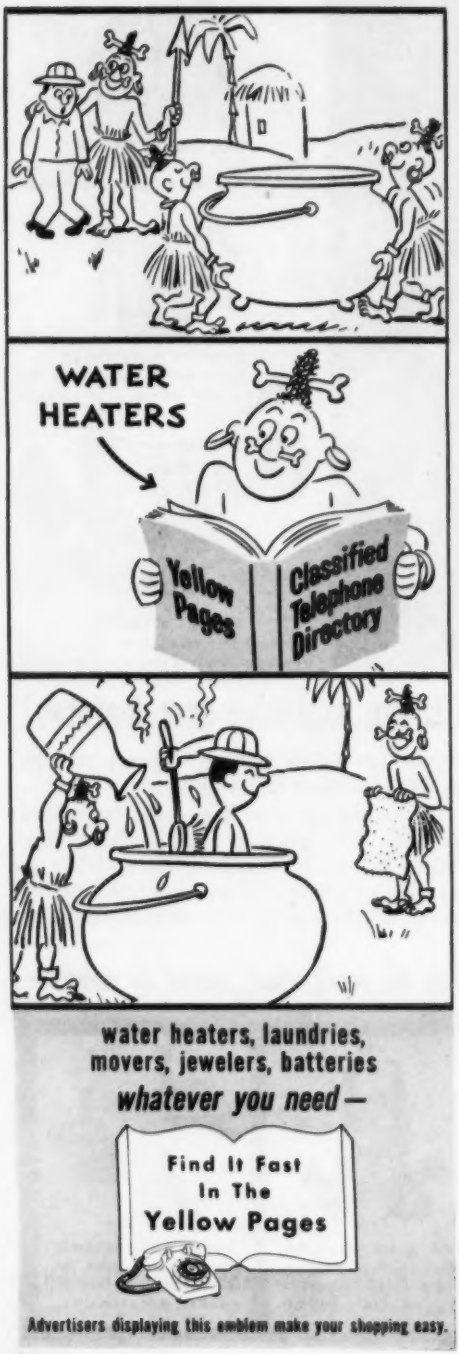


H45 ½ hp router. Another in Stanley's complete line. Powerful, rugged. Only $49.50



Stanley offers hundreds of router bits plus the most complete line of router accessories.



minutes from good to bad, but it never changes back that fast."

The freezing fog. This, said the late Charles F. Brooks, a Mount Washington weather expert who died in 1958, "is one of the most remarkable features of Mount Washington weather. When it is realized that the summit is in the fog more than half the time in winter, and that the temperature is almost invariably below freezing, the importance of the freezing fog can be appreciated." The fog, he explained, is in reality a cloud enveloping the summit. Its liquid is in the form of tiny, freezing droplets.

Freezing fog caught Phil Labbe, one winter day in 1957, when he was driving a heavy Sno Cat hauling a sled full of TV gear up to the peak. It cut his visibility to five feet. It covered the summit area and the road with ice, and the ice even formed a gentle incline up to and over the guard wall that protects the road's edge from a 1,500-foot drop. There was, in effect, no guard wall at all. A 100-m.p.h. wind, with 120-m.p.h gusts, blew Labbe's Sno Cat and sled sideways toward the cliff. Labbe got out of his predicament—but he had to abandon the sled and its expensive equipment.

Combinations of wind and cold. This phenomenon is—above all else—what makes Mount Washington's weather so awful. In most of the earth's iceboxes you get one or the other at a time. Weathermen figure temperature and wind together to come up with what they call "cooling units." By this figuring, Mount Washington has more cooling power—i.e., it can make you feel colder—than Little America, which, at its lowest temperature, was minus 72—but had no wind. On another day, Little America had minus 58 and a 43-m.p.h. wind. Washington, minus 25 with a 98-mile wind, was colder. Similar figuring shows Washington to be colder than Adelie Land, the Antarctic home of the blizzard; than Pike's Peak, which has less wind; than the Northern Great Plains, Labrador or Greenland; and colder than Sonnblick Observatory, Austria, which is 10,170 feet high but which has an average wind velocity of only 16 m.p.h.

Besides the cold, wind, snow and freezing fog of Mount Washington, there is the sheer wetness. If you are not wear-

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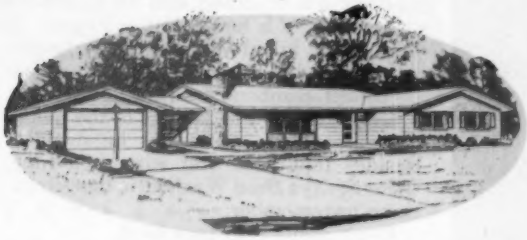

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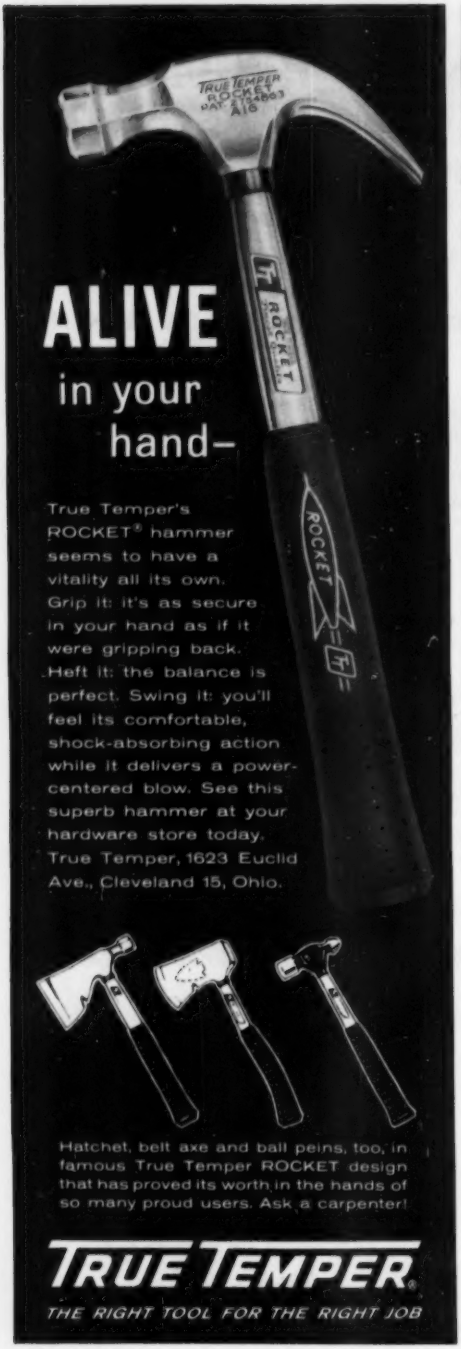


America's Meanest Little Mountain

ing a waterproof parka or raincoat it soaks your clothes, conducts the cold and wind right into your marrow, shoots down your body temperature, and thereby quickly destroys your strength and will power. It is very much as though you had fallen into the Arctic or Antarctic ocean; without special survivor clothing your life expectancy would be from seven to 30 minutes.

It was this combination of bad weather features that caught the boy and girl last July. Back in 1855, a girl, Lizzie Greene Bourne, succumbed to it; her clothing was drenched, and she died within 300 feet of a house at the summit. It caught and killed William B. Curtis and Allan Ormsbee, trained athletes and experienced climbers, in June, 1900.

Great though the dangers of the mountain are, they can easily be avoided. Besides that pack and winter clothing, there is, says Brad Washburn, one simple thing to remember:

Don't hesitate to turn back.

"The one thing," Washburn says, "that has been the outstanding cause of accidents is the lack of appreciation on the part of so many people that it is easier to walk downhill for a mile than uphill for 200 yards under certain conditions—i.e., Mount Washington weather."

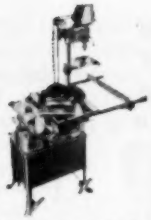
When to quit. Washburn says you should turn back as soon as you begin to get cold, or as soon as you feel progressively colder, or as soon as you feel yourself tiring. "With few exceptions, all those who died did so *because they struggled to get farther up.* They knew there was shelter at the summit.

"But they didn't know that the minute you turn around and walk downhill you start to warm up again. Unless you move fairly fast, you can't warm up. But you do, going downhill. Your arms and legs move fast and get the blood going."

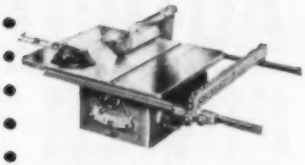
Brad Washburn has three times climbed Mount McKinley, North America's highest, and has been first man up many Alaskan peaks. I asked him if he had ever turned around and started down. "Yes, many times, both in Alaska and on Mount Washington," he said.

Practicing what Washburn both preaches and practices may save your life, and those of people you're with, on Mount Washington. END

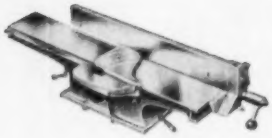
10" Band Saw



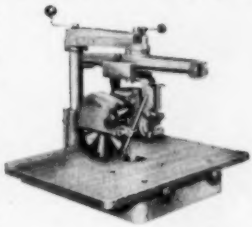
Delta Shop—combines Saw, Jointer, Drill Press, Sander.



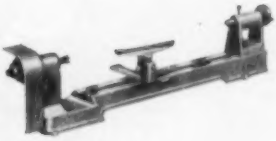
9" Tilting Arbor Circular Saw



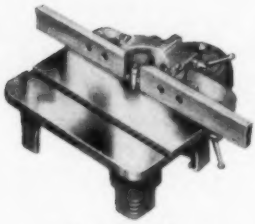
Deluxe 4" Jointer



"Super 900" Radial Saw

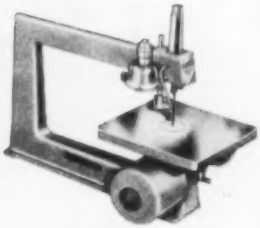


14/11 Lathe



Heavy Duty Shaper

11" Drill Press



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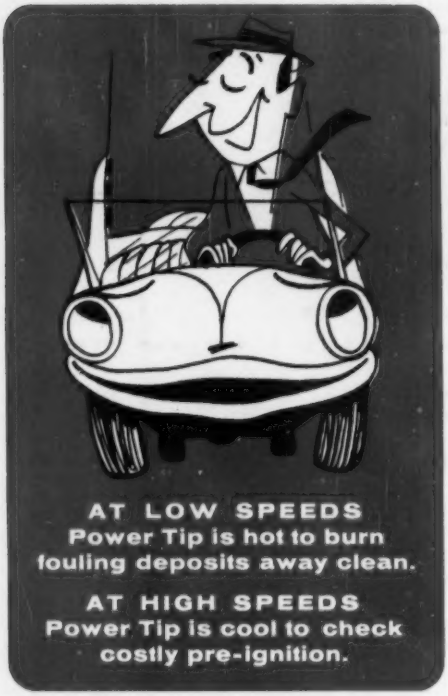

"FIRE UP" AT ALL SPEEDS WITH AUTO-LITE® POWER TIP!

Power Tip cleans itself while you drive!

Revolution in Magnets

[*Continued from page 127*]

(by an outside magnetic force) stay that way. Electromagnets have domains that fall into and out of alignment easily.

How to make better magnets. The great practical value of the scientists' new knowledge is that how-to-do-it quality.

The iron-powder magnets are one example. The theory said that a very small, long and narrow particle of iron—about 50 atoms (a tenth of a millionth of an inch) wide—would have all its atoms lined up in one single domain. It would be very difficult to demagnetize because of its shape and therefore would make an excellent permanent magnet.

No one had ever made such small, carefully shaped bits of iron before. It took Thomas Paine and his associates a couple of years to get the metallurgy right, but the gamble paid off. The process isn't perfect yet—not all the particles are long enough and many of them are knobby.

Electromagnets. The magnets most widely used—in motors, transformers, doorbells—are the electromagnets.

Only one or two percent of the electricity passing through a transformer is wasted in turning magnetic atoms back and forth. Still, you pay for the waste. The loss comes to $50,000,000 a year.

And that's only transformers. So any improvement is not to be sneezed at.

The latest is magnetic steel with its cube-shaped iron crystals lined up in two directions—like ice cubes in a tray. (Westinghouse's brand is Cubex; GE's is Four Square.) Iron atoms line up their magnetism most easily parallel to a crystal edge, so this steel is easy to magnetize in two directions—lengthwise and crosswise. That simplifies the manufacture of electromagnets with odd shapes, and should cut the cost of some types.

Purer steel would help. That's because impurities retard the turning of the iron atoms. But paradoxically, 100-percent-pure iron won't do—its atoms line up with the crystal edges and won't turn.

But what is magnetism? It's a force—one of the few fundamental forces in the universe. The scientists know how to generate it and control it. They can calculate—very, very accurately—its actions. But they can't "explain" it.

Not yet. The day they can, a whole new world will open up. END

What kind of a car do you want, exactly? Chevrolet has a choice of nine engines, five transmissions, two suspension systems, regular or Positraction rear axles, special cams, solid or hydraulic valve lifters, two air conditioning systems, even Fuel Injection—the list of extra-cost options is astonishing. But what it means is that you can virtually design your own car, tailored precisely to your needs. Here's one case in point:

"I 'built' our Chevy as a packhorse"

"My wife always puts down 'profession: housewife' on the income tax forms—but she'd be a lot more accurate if she made it 'bus driver.' We've got a Little Leaguer, a Boy Scout and a daughter in ballet classes, plus a fanatic interest in gardening, and it seems to me she spends 90 per cent of her time transporting kids or plants somewhere.

"So when it came new car time for us I took Chevy's whopping list of options and sat down to 'build' a car that would make her job easier. The nine-passenger wagon, of course, because we *have* to have the space—and the kids love that rear-facing third seat.

"The budget pointed to that penny-saving Six engine, but Powerglide and power steering were almost necessities—all her driving is stop-and-go neighborhood stuff.

"But I made myself a real hero with something she'd never have thought of—Positraction. She still doesn't know *how* it works but to hear her talk you'd think I'd invented the wheel—she can cruise right through a foot of snow or the spring mud on that dirt road out to Wolcott's Nursery without a whisper of wheelspin. But I guess I did almost too good a job; that car is *hers*, and I practically have to pry her fingers off the wheel to borrow it!"

It's a fact; you can make a car *yours* all the way through with Chevy's terrific spread of options—sit down with the specs and see what you come up with! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

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when you own a Bolens Power-Pak convertible. Powerful, light-weight engine-handle unit drives them all . . . a tiller, a Sno-caster, and three rotary mower attachments. Change-over takes only 30 seconds, requires no tools. You save money, and you save storage space with a Bolens Power-Pak.

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BOLENS PRODUCTS DIVISION
Food Machinery & Chemical Corporation
Port Washington D4, Wisconsin

100-Knot Liner to Fly on Sea Wings

[*Continued from page 106*]

pellers of the new supercavitating type.

Sea trials, extending through all of 1961, will test this ship under climatic conditions ranging from tropical heat to northern cold where icing effects can be studied. Its travels may take it on runs in the Caribbean, up the Hudson, through the Great Lakes. Success of the exciting trials would open the way to building full-scale hydrofoil liners.

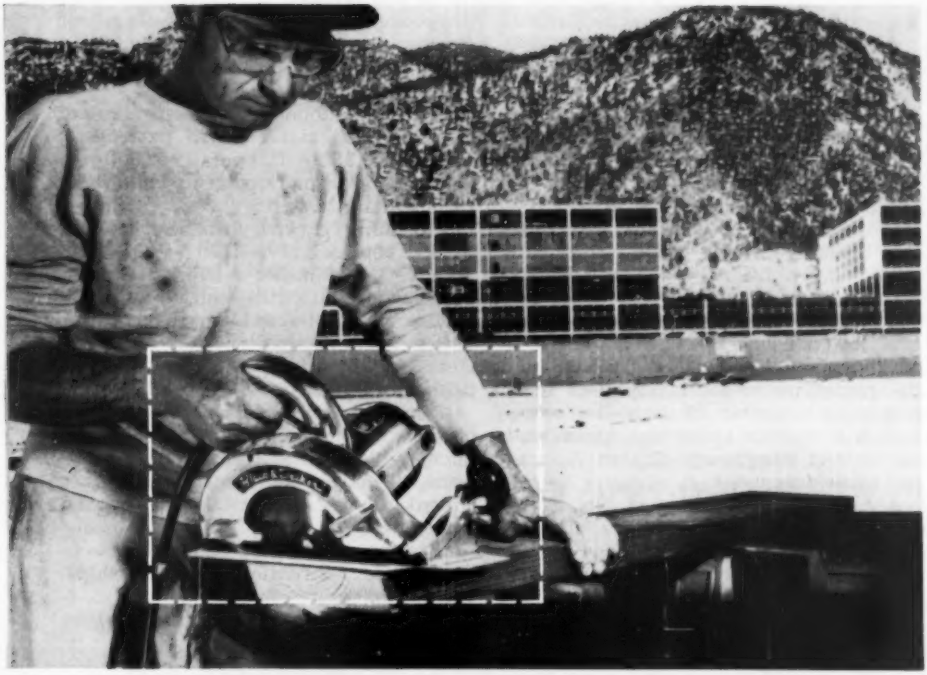
Wanted: a nickname. So novel that they may call for a new name, such as "foilers," the coming winged liners will help close the present gap between the speed of travel by sea and by air.

The fastest envisioned in the Grumman study, a 100-knot liner, will complete its 1,200-nautical-mile coastal run in only 12 hours. Passenger accommodations, for so brief a time, will be more like those of an airliner than a ship. Instead of staterooms, there will be airplane-style seats. As in a plane, probably your seat will have a belt, to be fastened while the ship is getting on and off its wings—and in occasional rough water, just as in bumpy air aloft. At other times you'll go freely about the ship.

Service à la Pullman. Accommodations on a transatlantic "foiler," which may be fast enough to get you there next day, will be much like those for an overnight trip by rail—individual staterooms, or roomettes; a modest-sized dining room; and a lounge. Such fancy trimmings as ballrooms and swimming pools will be superfluous; and your fare may pleasantly reflect the saving in operating cost.

An aluminum-hulled "foiler" will ride on three submerged wings, of 20- to 31-foot span or more, mounted on pivoted hull-supporting struts. To reduce draft in port, where the ship floats conventionally, the titanium-metal struts and foils are retracted above water. An auxiliary engine and propeller dispense with tugs for maneuvering.

Outward bound, foils are lowered and main engines come roaring to life. Through drive shafts within the struts, and bevel gears, power flows to main propellers on the foils. The hull rises from the sea, foilborne and free of the water's drag. A 50-knotter's hull rides 12 feet above the waves; a 100-knotter's, 18 feet. Meanwhile, the winglike foils "fly" under



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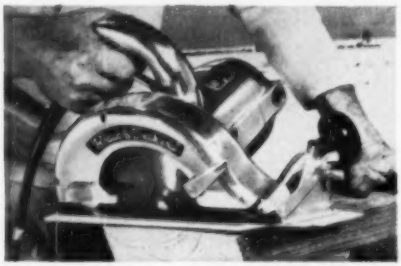

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water, three to six feet below the surface.

For steering, the whole after-strut, with foil and propeller, swivels like an outboard motor. Or, in an alternate plan, struts have rudder flaps above the foils.

Choice of designs. These specific designs are offered by Grumman:

1. Coastal liner of 100 knots (115 m.p.h.): 652 passengers; 500 tons; 251½ feet overall; approx. 60,000 hp. from three gas turbines driving three water propellers; conventional-type hull; range, 1,200 nautical miles.

2. Coastal liner, same as No. 1 except: 600 passengers; 247 ft. overall; seaplane-type hull. (This is the type that the prototype vessel is expected most nearly to resemble—though the prototype will operate at various speeds and ranges, and interchange different foils, to test other designs.)

3. Coastal liner, same as No. 2 except: 51,000 hp. from six gas turbines driving six air propellers.

4. Tranocean liner of 50 knots (nearly 60 m.p.h.): 150 passengers; 500 tons 251½ ft. overall; 13,500 hp. from three diesel compound engines (diesels whose exhaust runs gas turbines) driving three water propellers; conventional-type hull; range, 3,600 nautical miles.

5. Atomic-propelled transocean liner of 65 knots (75 m.p.h.): 320 passengers; 1,000 tons; 321½ ft. overall; 52,500 hp., from atomic reactor operating helium-gas turbine that drives single water propeller; reactor hung on extra strut beneath hull, in pod kept submerged 20 feet deep to save weight of heavy shielding; conventional-type hull, with well, into which reactor strut telescopes to reduce draft (after flooding some bottom compartments for extra shielding); range, practically unlimited.

Breaking the speed barrier. The speed of the world's fastest passenger ships has increased by just 10 knots in the past 50 years. Today's best marks—the liner United States' record Atlantic crossing averaging 35.59 knots, and naval vessels' similar top speeds—are believed close to the limit for conventional seagoing ships.

Hydrofoil craft, of which many of moderate size have been built before, long

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100-Knot Liner to Fly on Sea Wings

have offered the promising advantage of escaping the speed-limiting frictional drag of water on a hull.

But only now has come the conquest of the most formidable obstacle to greater speed—the cavitation barrier.

Cavitation, or low-pressure boiling, occurs when a marine propeller spins too fast. Vapor bubbles, forming in the near-vacuum left by the blades, collapse haphazardly and explosively on the blades' suction surface. Vibration, slip, destructive damage to the propeller result. This also happens to an over-speeding hydrofoil—in fact, a propeller blade is a kind of hydrofoil.

How the problem was solved. The new advance turns cavitation from a handicap into a help. It consists of purposely forming a vapor cavity so large as to envelop the whole suction face of a blade or foil—and then collapse, out of harm's way, well beyond the trailing edge. Because only one side of blade or foil touches water, this "supercavitation" actually reduces drag.

A cunningly calculated hydrofoil profile, typically with a blunt trailing edge, turns this trick. The first of several mathematical formulas yielding such a supercavitating shape was recently discovered by Marshall P. Tulin, of the Office of Naval Research.

Supercavitating foils and blades, while inefficient at moderate speeds, begin to show spectacular superiority above something like 70 knots. Propeller-tip speeds exceed this critical figure, on ships designed for 50 knots or more. So all the water propellers of the Grumman "foiler" designs are supercavitating; and designs faster than 70 knots have supercavitating hydrofoils. Those are the secrets of the amazing performances they promise.

Passenger ships will not be the only ones to apply the new principle. Its use for fast cargo ships, and for warships, may also be expected.

First of all to go into practical service may be the 110-foot prototype itself. Its prospective owner, the Maritime Administration, expects at the conclusion of its trials to charter or sell it for commercial operation—possibly as a sightseeing excursion vessel. Its future passengers may be riding a craft that has made maritime history. END

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Take aptitude and physical examinations. To be eligible, you must have a qualifying aptitude score and meet minimum physical requirements for your choice.

3. KNOW

...before enlistment!

If you qualify, you *know* you'll *get* the vocational training you like! Your choice is written into your future Army record—guaranteed *before* you enlist.

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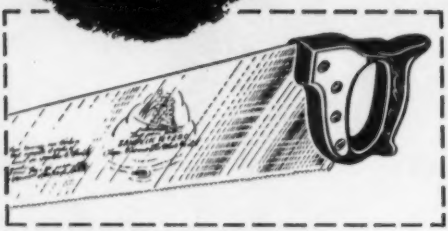

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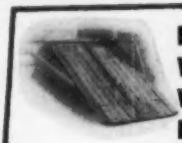

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Last Stop Before Space
[*Continued from page 93*]

shoots: mild, calm and clear much of the time. There are at least 15 launching pads, including four for Atlas, four being readied for Titan, and others underway for the biggest missile of all, one with 1,500,000-lb. thrust.

Caribbean islands provide a natural series of data-gathering locations along the first portion of the test range, which presently ends at Ascension Island in the South Atlantic, but could be extended easily with radar picket ships. The South Atlantic itself is relatively free of shipping that might be endangered by falling missiles. A ready-made logistics base and air field (Patrick AFB) is 18 miles south, and services the range. Some $480,000,000 has already been spent in instrumenting the downrange stations for telemetry. And last, but by no means least, engineers and their wives like to live in Cocoa Beach. If the range were located in Alaska, for example, firing down the Aleutian chain, the problems of labor turnover would be prohibitive—even if the weather stayed good, which it wouldn't.

The gloomy side. It isn't all joy and gladness at Cocoa Beach. Despite the million-dollar motels sprouting like glittering mushrooms, the town is struggling with the problems of all forced-draft developments. The area's population has shot from 7,000 to 40,000 since 1950. The schools have four times as many pupils as they had then. Morning and night, when the shift changes for the 18,000 people (five civilians to every military man) who now work at either Patrick AFB or the cape, the causeway to Cocoa Beach is jammed for 12 miles with impenetrable traffic. Good housing is hard to get, even if you are willing to pay the going rate: $125 a month for a small, two-bedroom apartment. Drive-in movies become churches on Sunday. Prices, inevitably, have ridden up on the golden tide of a $14,000,000-per-month payroll distributed in this tight little area.

There are also some glints of light. Because the community is predominantly populated by top-flight engineers and Air Force people, crime has not been able to get a foothold. Miami hoods tried to get a numbers game going, without success. There is not a single redlight operation in the county. Offspring of the

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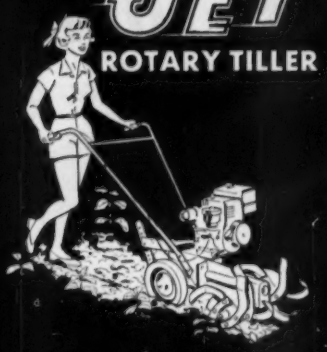

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Last Stop Before Space

bulge-brain scientists seem to be running true to form; intelligence tests given in the crammed Cocoa Beach schools revealed that the missile-minded youngsters scored appreciably higher than kids of the same age groups elsewhere.

Smoke on the horizon. Old-time Cocoa Beach residents welcome the engineers and Air Force people and their families. They are, however, unhappy about a recent purchase of a hundred acres for a big oil refinery. "We hate to think of looking up and seeing the sky covered with smoke," said Bill Fischer, a Cocoa Beach old-timer, as he and I picked fresh grapefruit off trees in his grove near the proposed refinery site. "We came down here to get away from smoke and fumes. We enjoy the missiles. My wife Helen and I never miss a firing. We have a grandstand seat on our front porch. But missiles are clean. They don't fill the air with smog and fumes."

Port Canaveral, on the ocean just south of the cape, is beginning to handle ocean-going tankers and freighters in a big way. Local boosters predict they will soon be operating one of the most active shipping ports on the East Coast. Taxes in the area support this thesis. One local resident told me that his taxes had jumped from $95 in 1956 to $1,900 in 1958. Housing is expanding at a frantic pace. A development for Air Force people is now almost complete just south of Patrick AFB—a thousand of the finest units to be found anywhere in the USAF. Civilian developments are appearing along Route A-1-A south of Patrick, and inland, toward Orlando, to take care of the continuing influx of missile employees.

Thousands of civilians are employed in the huge $7,000,000 Technical Laboratory, where telemetry data are fed into computers and reduced automatically after every flight. Nor does the activity stop at Cocoa Beach. The Missile Test Center operates 11 air fields, a fleet of ocean-going telemetry ships, 12 camera sites in Florida, and 40 airplanes. As testing moves to the man-in-space phase, the range will, of course, become much more complex. (When a space capsule is down at sea, with a man in it, you hunt with a lot more ships and planes than you'd use in looking for a mouse!)

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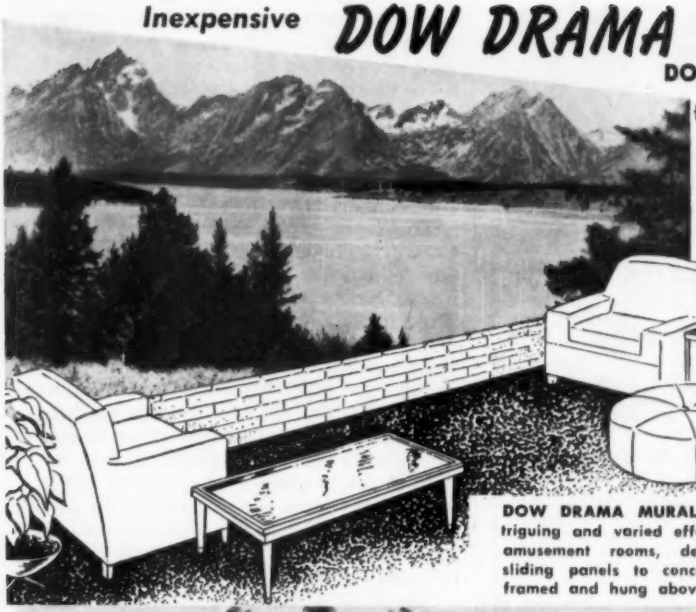

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taking precautions taken to assure range safety, there have been a few narrow escapes. The first Polaris missile that had to be air-destroyed—the one that blew up like a bomb in the Banana River—gave local residents a special designation for the Polaris. Not IRBM—Intermediate Range Ballistic Missile—but IBRM—Into Banana River Missile.

The man who does the worrying for Cocoa Beach—and the downrange islands too—is stocky Lt. Col. Ray Stephens, Range Safety Officer. When a test bird starts to wander off course, Col. Stephens presses a red button on his console, and the straying missile explodes in a flash of fire.

"The really critical period is on lift-off," Col. Stephens told me. "With Cocoa Beach only 15 miles away, there's no time to fiddle around. If a bird is going to blow, we want her to do it in the air. Lox and rocket fuel are explosive on impact. They'd blow a helluva hole in the real estate if we let 'em."

"Or in the Banana River," I said, smiling. "Even using solid fuel."

"Yes," Ray Stephens said, also smiling. "The second Polaris didn't do too well, either. It sort of blew up on the pad and started a fire which burned over a lot of the south end of the cape. I heard one report to the effect that 600 rattlesnakes crossed the highway trying to get clear of the flames. Come to check it later, it was 16. Still—that's quite a few snakes."

Everybody's secrets. Most efforts made by the hard-working security people to keep missile shoots a secret are wasted. Everybody in town, a while back, had some private way of knowing the day and hour of a big launch (a dog was supposed to howl in a certain doleful manner, or there's a run on sandwiches and coffee "to go" in a downtown restaurant). Actually, it's so routine now that the news is published, unofficially but with great accuracy, in the local papers. And people who used to sit staring fixedly at the cape for hours now relax until the "rumble" comes. Then you better be fast on your feet, however, or you may be trampled in the rush. When they hear the rumble, everybody in Cocoa Beach—be they downing a drink or diapering the baby—sets aside the business

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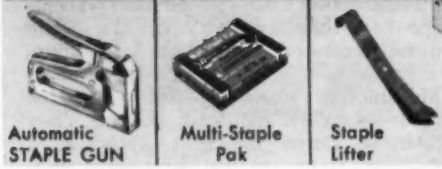

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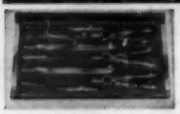

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at hand and breaks for the doors. The big birds go so slowly in the first few seconds that you can catch them quite low.

Now that the biggest missiles, Thor and Atlas, are being airlifted from the West Coast factories to the "skid-strip" on Cape Canaveral, the delivery situation has eased considerably from the days when they were trucked in. Liquid oxygen is manufactured in a large plant on the cape itself, and the dangerous propellants are stored underground in guarded revetments. Strict safety precautions are taken during every step of the program, and serious accidents have been few.

Missiles and wildlife. Though missile launchings until recently have been infrequent, 17 Atlases, 27 Thors, 14 Jupiters, dozens of Snarks, four simulated Polarises and a scattering of smaller-fry rockets have risen, or partly risen, from Cape Canaveral. Still, there is no worry that fish, birds or game will depart from the area. An Atlas engineer was really shaken up not long ago when, upon peering through his periscope from the blockhouse one minute before lift-off, he saw what he thought was a man walk casually over close to the still-quiet ICBM. He was taking in a deep breath to call an emergency hold when the creature moved from behind some scrub growth and he saw it was a deer.

"He wasn't hurt," the Atlas engineer reports. "We looked for him later, and he was gone. One thing we're pretty sure of. That was the most scared deer in the U.S.A. when Baby, out there, let go with all three engines."

Residents of Cocoa Beach have no beefs about the missile activity. It brings them money and excitement with a minimum of headaches. They refer to the cape as Malfunction Junction—but with the fondness of an indulgent parent. They refer to Cocoa Beach, proudly, as a Whoom Town—to differentiate it from old-fashioned boom towns. Despite the murderous taxes and the explosive real-estate prices, people are still flocking to Cocoa Beach in droves to buy, build and work. As of March, 1959, the whoom in Cocoa Beach is merely beginning its ultimate, hypersonic trip out of this world. END

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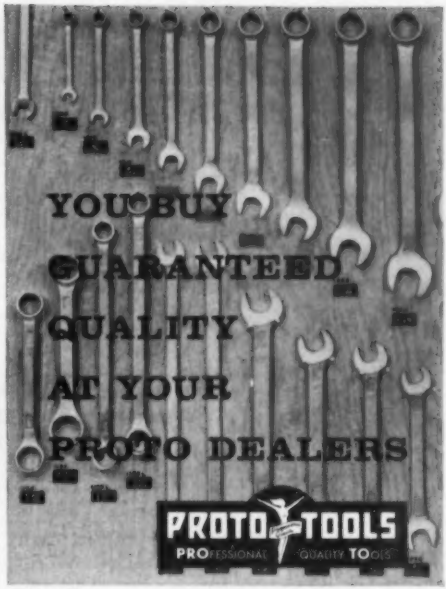

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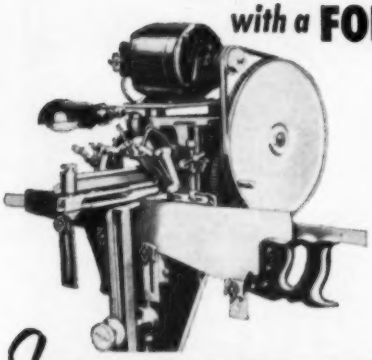

"Last year's profit amounted to $3,000. Not so bad for a one-man outfit"—from Chas. C. Hough. James B. Williams wrote us—"I made $765 last year filing saws, and it sure comes in handy. I do this work in my spare time." Men in communities of all sizes make from $3 to $6 an hour with the Foley Saw Filer working full time or part time.

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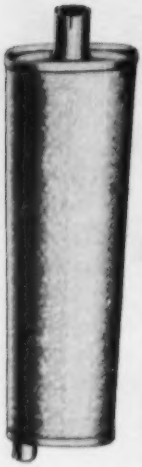

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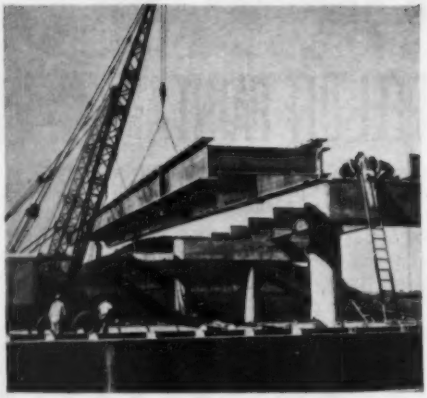

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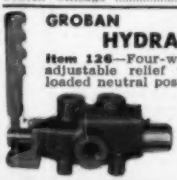

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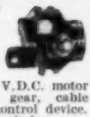

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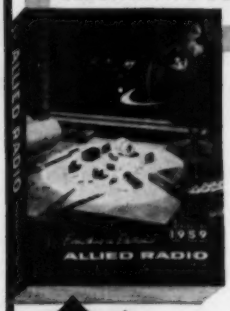

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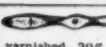

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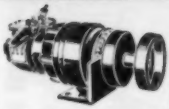

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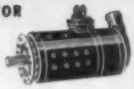

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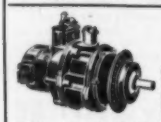

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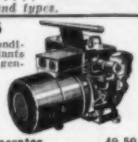

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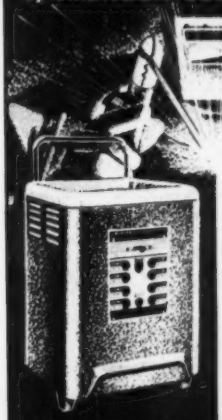

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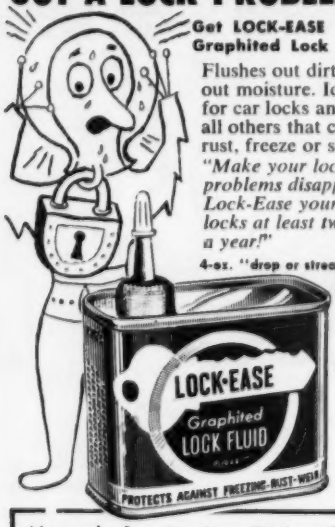

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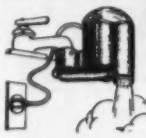

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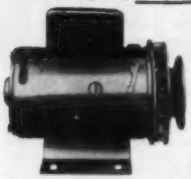

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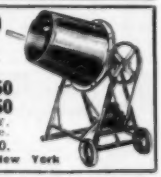

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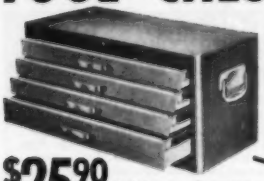

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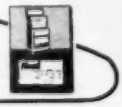

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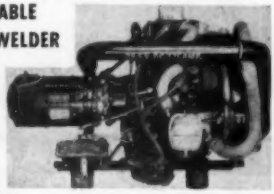

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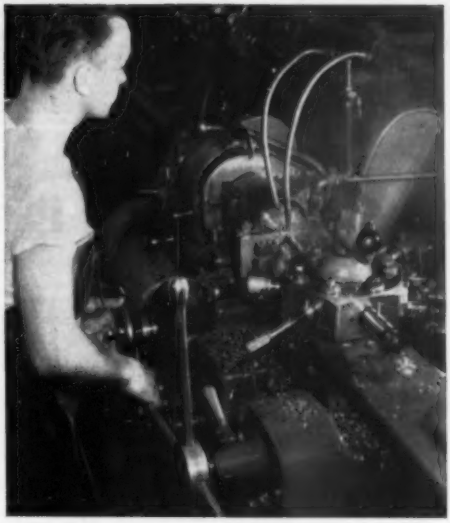

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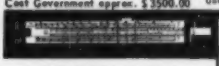

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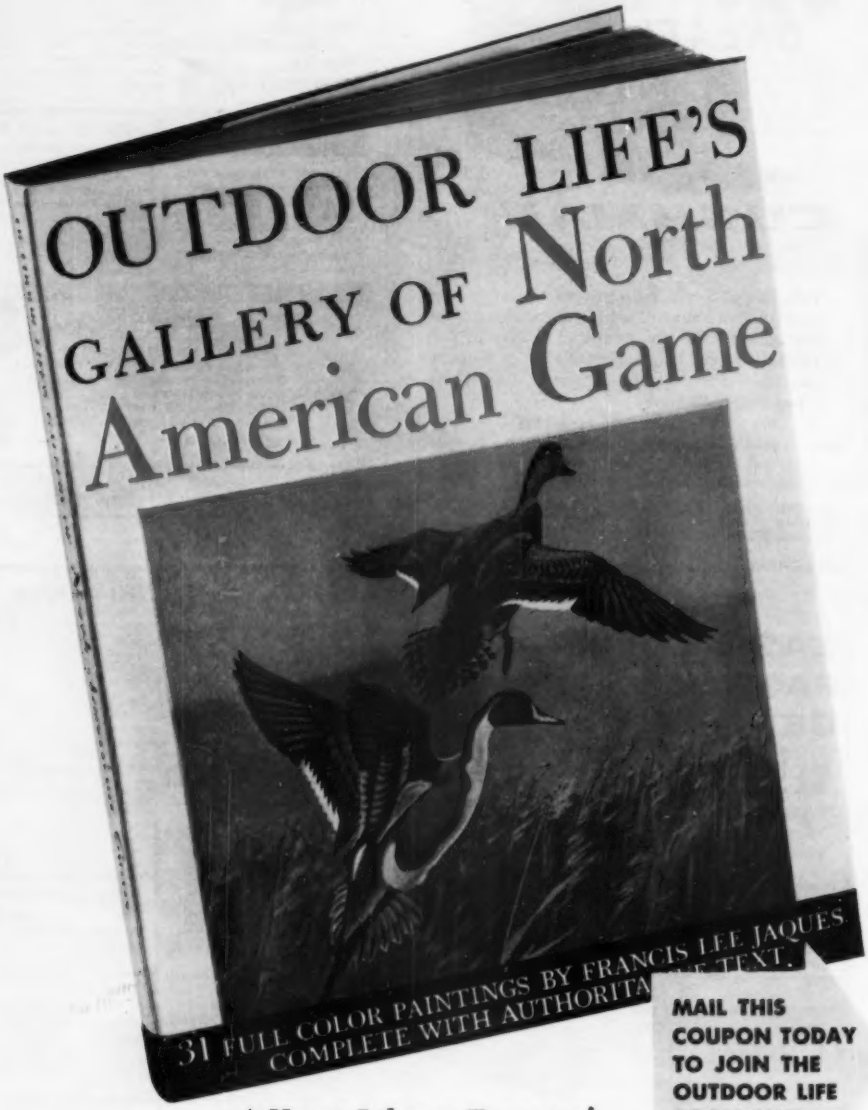

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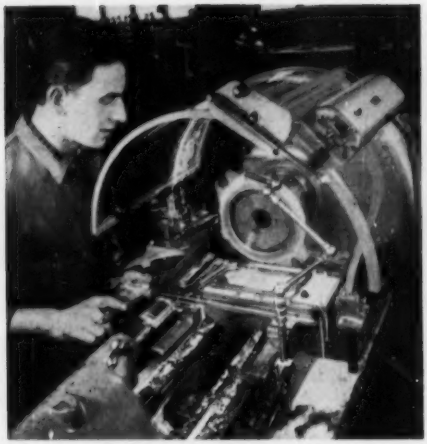

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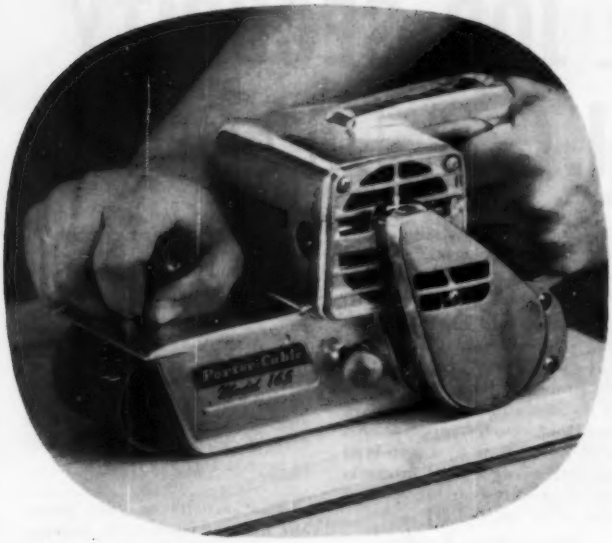
SIDE-WHEELER. Patterned after the old-fashioned steamboats that once plied the Mississippi River, this modern vessel is built completely of plywood. It is propelled by 16 plywood paddles on each of its 8½-foot wheels. An 85-hp. engine powers them. Builder and owner is Stanley Hammer of Winona, Minn.

SCOOTER BOX. An ordinary farm mailbox has replaced rear seat and spare tire on the scooter above at right. It carries the textbooks, drawing instruments, lunch and raincoat of Jerry R. Weibel, University of Illinois freshman. When he has a passenger he removes the box and substitutes the conventional extra seat.

NECK VACUUM. Judging from the smile of pleasure on the customer's face, the problem of those itchy hairs that work down the back of the neck during a haircut has been solved. Bernard Passmore, Chicago barber, demonstrates his solution here: a vacuum cleaner for the neck that sucks away the loose hairs.



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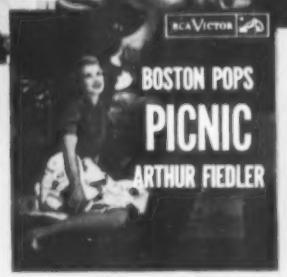

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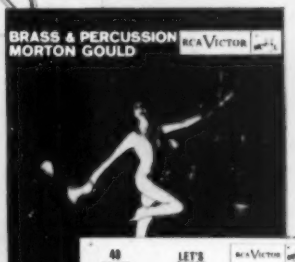

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